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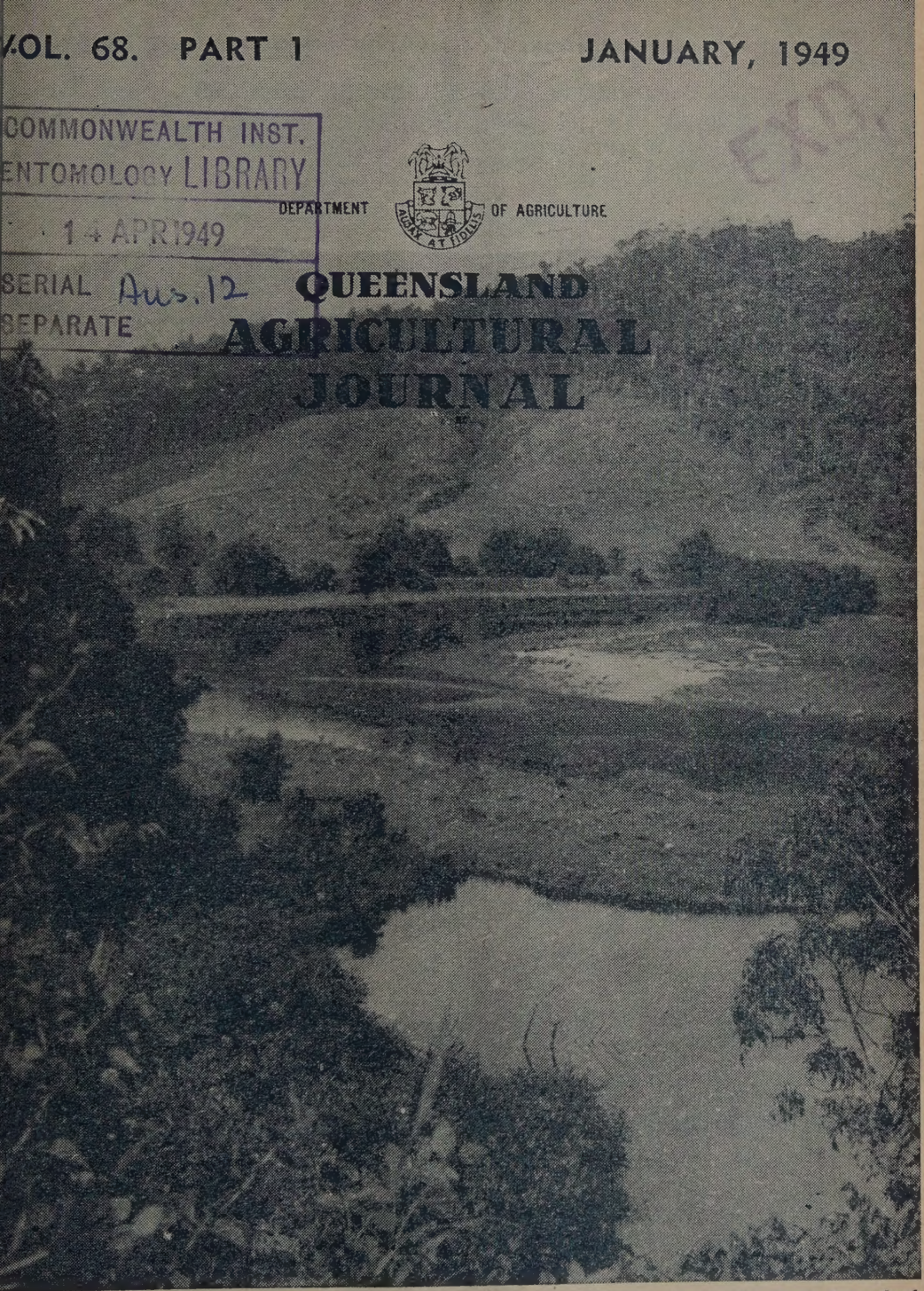

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Diseases of Pome Fruit

Feeding Dairy Cows

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Fat Lamb Production

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Sweet Potato Growing in Central Queensland.

O. L. HASSELL, Senior Adviser in Agriculture.

ALTHOUGH there are thousands of acres of soil in east-central Queensland eminently suitable for the growing of sweet potatoes, this crop has not received the attention it merits. Several growers who have appreciated the value of sweet potatoes for pig feed have planted areas as large as 200 acres, but for the most part plantings are small. When English potatoes are available there is not a large market demand for sweet potatoes, but there is a number of varieties at present being grown in this area which are first class table varieties.

With the likelihood that the prevailing high price for pigs will continue for some time to come, the possibilities for the expansion of sweet potato growing for feeding pigs in central Queensland are considerable. In the Rossmoya district near Rockhampton one grower has 200 acres under sweet potatoes. The practice he has found most profitable is to grow the potatoes on the same land for three years, thus allowing for two ratoon crops. With the supplementary feeding of other foods such as grain sorghum and meatmeal, this farmer has turned off an average of 500 baconers for some years past. Another grower in the same locality usually has 100 acres under sweet potatoes and turns off approximately 300 baconers per year.

Soils.

All heavy clay soils should be avoided for this crop. In central Queensland the most suitable soils have proved to be the red clay loams and red loams of the Rossmoya, Milman and Mt. Larcom districts. The sandy alluvial loams of the coastal and inland areas and the brown loams of the softwood scrubs of the Callide and Dawson Valleys also favour the successful production of sweet potatoes. Sweet potatoes do well following the ploughing-under of a leguminous green manure crop.

Propagation.

The sweet potato is propagated from cuttings. Tubers for the purpose of obtaining cuttings should be planted as soon as all danger of frost is over. Careful selection of tubers is worthwhile. The selection should be confined to plants producing satisfactory yields of

smooth, well shaped, marketable roots of a type characteristic of the variety to be propagated. Before planting, all tubers should be inspected to see if there is any sign of the sweet potato weevil.* If any infestation is present the tubers should be discarded and material from a known clean area obtained.

Selected tubers should be planted in a nursery plot of well drained fertile soil, where irrigation can be applied if required. If the tubers are well shot when planted, a good supply of runners can usually be obtained in six weeks. With some rambling varieties many hundreds of cuttings can be obtained from one tuber in a season.

Varieties.

The sweet potato requires a growing season of three-and-a-half to five months, and in accordance with their maturing habits types can be classed as early, mid- or late-season. Varieties that have been grown for many years in the central district and which can be recommended for planting for both pig feed and culinary purposes are White Maltese and Porto Rico. Both are mid-season types and heavy yielders. These varieties, together with a number of others which have been tried in recent years, are described below.

Porto Rico (Plates 1 and 2).

Several strains of Porto Rico have been grown, including a local strain, Porto Rico (Unit 7) and Porto Rico (Bunch). The first two are similar. The leaf is of variable shape and size but for the most part is large with distinct shoulders. The veins are green in Porto Rico (Unit 7) and purple in Porto Rico (local) with a purple spot at the base of the leaf in both strains. The stem is purple and an abundance of vine and leaf is produced, especially with Porto Rico (local). The tubers are medium to large in size, well shaped, with bronzy pink skin; the flesh is yellow, with dry texture and good flavour. Both strains are mid-season and are strongly recommended for culinary purposes and for grazing by pigs. In central Queensland at present Porto Rico (local) is widely used for pig grazing.

In Porto Rico (Bunch) the leaf is very large and has distinct shoulders, green veins and a purple spot at the base. The stem is purple, the growth is characteristically bunched and there are no runners. The tubers are elongated and have a light pink skin; the flesh is yellow, with only fair texture and flavour; maturity is late. This variety has not shown great promise for farm conditions because its yield is below average but it would no doubt be useful in home gardens where a bunched growth and an absence of runners are desirable.

White Maltese (Plate 3).

In the White Maltese variety the leaves are small and heart-shaped, with the main vein purple and lateral veins green; a purple spot occurs at the base of the leaf. The stems are green and thin but the variety rambles extensively. Tubers have a rough white skin and may grow to a great size under good conditions; the flesh is white, with soft texture and a sweet flavour; it is a mid-season type. This variety is a heavy yielder and has been popular in the central district for many years, especially as a grazing crop for pigs.

* *Cylas formicarius* Fahr.

Abundance (Plate 4).

Abundance is a good variety for both culinary and grazing purposes and is recommended, especially for sandy coastal lands. The leaf is characteristic, being small, pointed and slightly shouldered, with green veins. The stems are green, thick and hairy and the variety exhibits a strong rambling habit of growth. The tubers are usually long and tapering, with a slightly wrinkled red skin; the flesh is white with grey flecks, stringless and floury in texture, and with a very good mild sweet potato flavour. The variety is a mid-season type which yields heavily on light soils.

Brooks' Gem (Plate 5).

The leaf of Brooks' Gem is of medium size and fan-shaped, with a distinct frill and purple veins which make the variety readily distinguishable. The stem is green, smooth and of a medium thickness, while growth is bunched and of a non-rambling habit. The tubers are long and tapering, with a rough white skin; the flesh is white, with a floury texture and very sweet flavour. This is an excellent table variety and most suitable for digging, as the crop is carried under the vine in the row in which it is planted.

Louisiana No. 9 (Plate 6).

Louisiana No. 9 is a new variety in Queensland. The leaf is medium to large in size, tending to a round shape, with green veins and a purple spot at the base. The stem is of medium thickness, green with purple tinges; growth habit tends to be bunchy and runners are not produced freely. The tubers are medium sized, with a smooth, light pink skin; the flesh is yellow with a dry texture and an attractive flavour which makes it very suitable as a table variety. The variety is late-maturing and only a medium yielder, but its good cooking qualities make it popular.

Nancy Gold (Plate 7).

Nancy Gold is also a comparatively new variety. It has small heart-shaped leaves with slight shoulders and the veins are green and well defined. The stem is green, thick and slightly hairy, and growth is of a semi-rambling habit. The tubers are round and evenly shaped, with a very light pink skin showing veins; they are borne close to the surface of the ground. The flesh is deep yellow but the texture is too soft and watery to be popular. The variety is an early type of medium yielding ability.

Alton Downs Red (Plate 8).

Alton Downs Red is a good general purpose sweet potato which is early maturing and a heavy yielder. The leaf is medium sized and elongated, with shoulders; the veins are purple. The stem is of medium thickness, green with purple shades merging into deep purple at the axis of the leaf; the growth is of a moderately rambling habit. The tuber is elongated, with a smooth, light red skin; the flesh is yellow, with a dry stringless texture and of excellent flavour.

Nancy Hall (Plate 9).

Nancy Hall is a new variety which up to the present has not been particularly successful in the central district, but it appears to be worthy of further trial. It is a mid-season variety of medium yielding

capacity. The leaves are of medium size and heart-shaped, with green veins. The stem is green and of medium thickness and the vines ramble extensively. The tuber is large, with a smooth, very light pink skin; the flesh is light yellow, of dry texture and of fair flavour.

Porto Morada (Plate 10).

The Porto Morada variety has medium sized leaves of elongated shape, with shoulders; the veins are red. The stem is green, reddening with age, and growth is bunchy. The tuber is large, with a smooth, light pink to red skin; the flesh is yellow, of excellent flavour and somewhat dry in texture. It is a late-season variety and crops well. This variety has the habit of forming tubers some distance away from the parent plant, which makes it awkward for digging at harvest, but the variety is suitable for grazing by pigs.

Planting.

The soil for sweet potatoes should be well prepared to ensure a weed-free seed-bed. Planting material consists of cuttings, each about 15 inches long, from the nursery plot. A suitable distance for planting on most soils is three feet apart in the row and four feet between the rows. With this rate of planting 3,630 cuttings per acre would be required. Where the sweet potatoes are to be harvested by hand, the most suitable method of planting is on ridges. The cuttings can be dibbled in along the surface of the ridge, or the cuttings can be placed the correct distance apart along the top of the ridge and pressed into the soft moist ground with a blunt board, the pressure being put on the middle of the cutting. The latter method is quicker than dibbling or planting with a spade. Where large areas are to be planted the quickest method of planting is by ploughing-in the cuttings when the ground is getting its final ploughing.

A method for large scale planting which has been practised successfully by a grower at Rossmoya is to employ three or four men, a tractor and a three-furrow disc plough. One or two men are fully occupied cutting vines, one man drives the tractor and a man sitting on the plough drops plants along the plough furrow. The plants are dropped about two feet apart in the last furrow of every second run of the plough, leaving a distance of approximately six feet between the rows. Upwards of 8 acres per day have been planted in this manner.

Cultivation.

The only cultivation necessary is to check weed growth until the vines commence to run. In well prepared land it is seldom that more than one cultivation is required.

Ratooning.

A common practice where sweet potatoes are grown for grazing by pigs is to have a first-season crop and one or more ratoon crops on the same land. Experience is required in determining when a paddock has been sufficiently grazed. If a paddock is over-grazed, insufficient tubers will be left in the ground to start the following crop, and a light crop will result. In preparation for the ratoon crop, the field is well harrowed down at the end of the winter after grazing, and is then allowed to remain undisturbed until there is sufficient soil moisture to start growth of the tubers left in the ground. When the plants are well grown the field is again grazed.

Harvesting.

To ascertain whether the crop is ripe and fit to dig, a tuber should be cut in two; if ripe the cut surface will dry clear according to the colour, if unripe it will dry a dark or greenish colour. With most types of sweet potatoes, where harvesting for market it is not possible to plough out because of the risk of damaging a large percentage of the tubers. The most suitable method of digging is with a long-pronged garden fork. To assist in digging the tubers the vines should be cut first and removed from the field.

Grazing by Pigs.

Where the sweet potato crop is to be used for grazing by pigs, the paddocks should be subdivided into conveniently sized areas and the pigs allowed to do their own harvesting. If the sub-divisions are too large a good deal of waste may occur. A suitable fence for holding pigs on sweet potatoes can be made with four barbed wires. The first wire is placed six inches from the ground, the second nine inches above that, the third nine inches from the second and the top wire 18 inches above the third wire. If the field is not over-crowded and sufficient tubers are present under the vines, the pigs rarely attempt to force their way through the fence.

One big grower has paddocks approximately 25 acres in size, his boundary fences consisting of a three-wire fence, with 24-inch, 17 gauge, 3-inch mesh wire netting attached. He has found this type of fence quite suitable for the purpose and it is reasonably cheap. The pigs are turned into the crop at about the weaner stage to do their own harvesting. A feed supplement of grain sorghum is fed at the rate of 1½ lb. per pig per day and the animals are also allowed free access to hoppers containing meatmeal. No special topping off is carried out. The pigs are mustered occasionally from the paddocks and those fit for sale picked out.

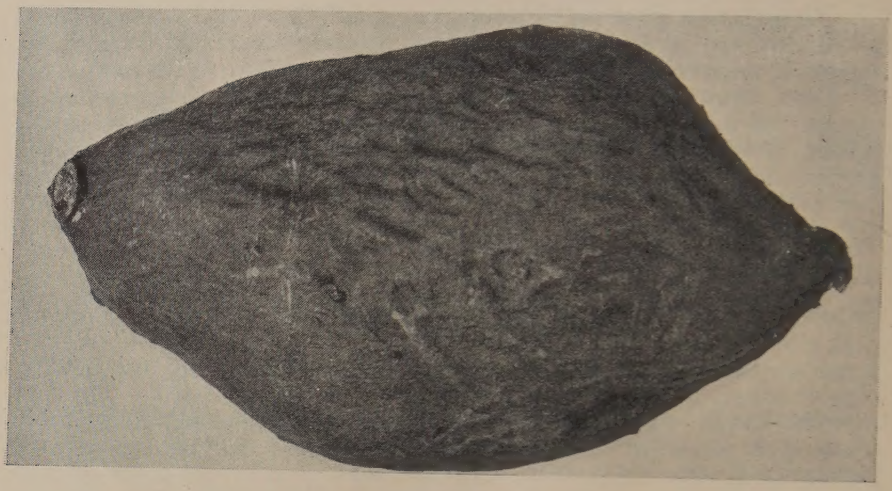
The number of pigs that a field of sweet potatoes can carry will depend, of course, on the weight of tubers available in the crop. In the central district a safe margin to work on is from three to four pigs per acre on a fairly well-grown crop.

Pests.

The main pest of the sweet potato is the sweet potato weevil. Though the beetles attack the leaves, stems and tubers, the main source of loss is damage to the tubers by the larvae, which are stout, white legless grubs about one-third of an inch long. Tubers may be rendered valueless by the burrowing of the larvae.

As the pest is carried over from one season to another in tubers and vines, it is essential to clean up an infested area after harvesting. This is done by collecting all infested material and destroying it, as well as eliminating volunteer plants. Planting material should be carefully examined for signs of infestation, and it is a good idea to have the propagation bed well removed from the paddock to be planted.

Thorough cultivation of the land prior to planting and during the early stages of growth, to produce a fine tilth, will increase the vigour of the plants and will also afford some protection to the root tissues against early attack. Insecticides, such as lead arsenate, are useful against this pest only where the beetles are feeding on the leaves and stems. When tubers are infested it is not practicable to kill the larvae.



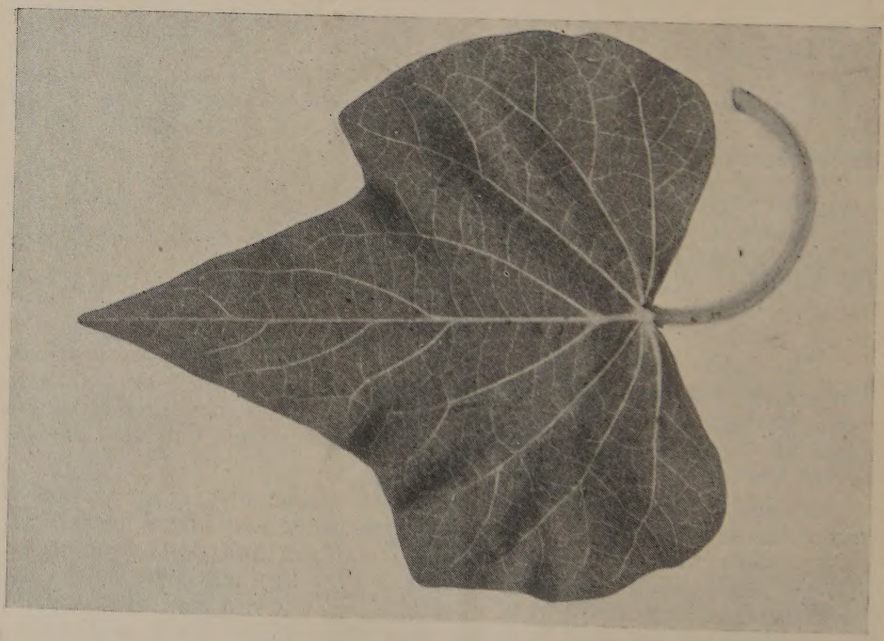


Plate 1.

ABUNDANCE.—Tuber about 7 inches long.

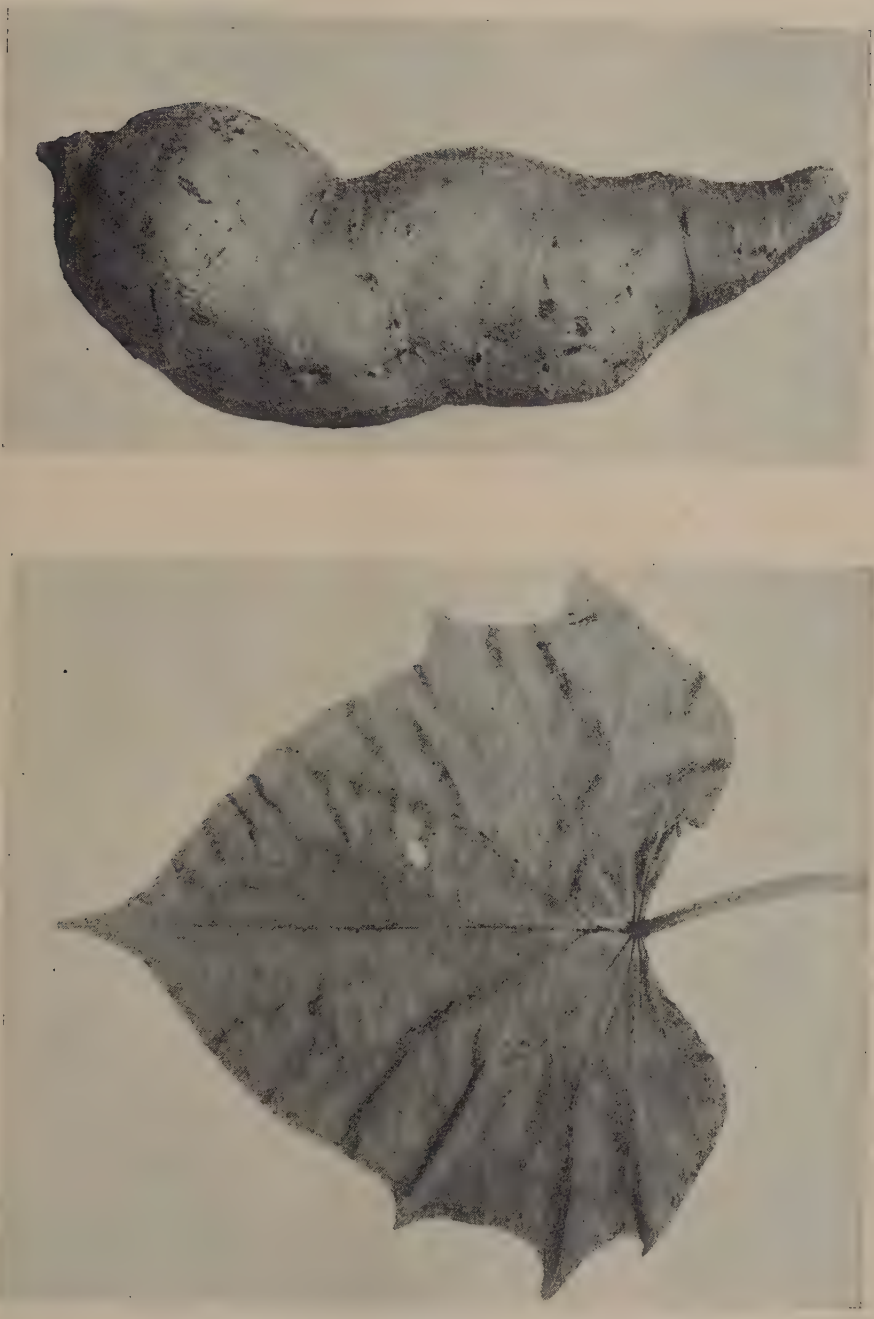


Plate 2.
ALTON DOWNS RED.—Tuber about 7½ inches long.

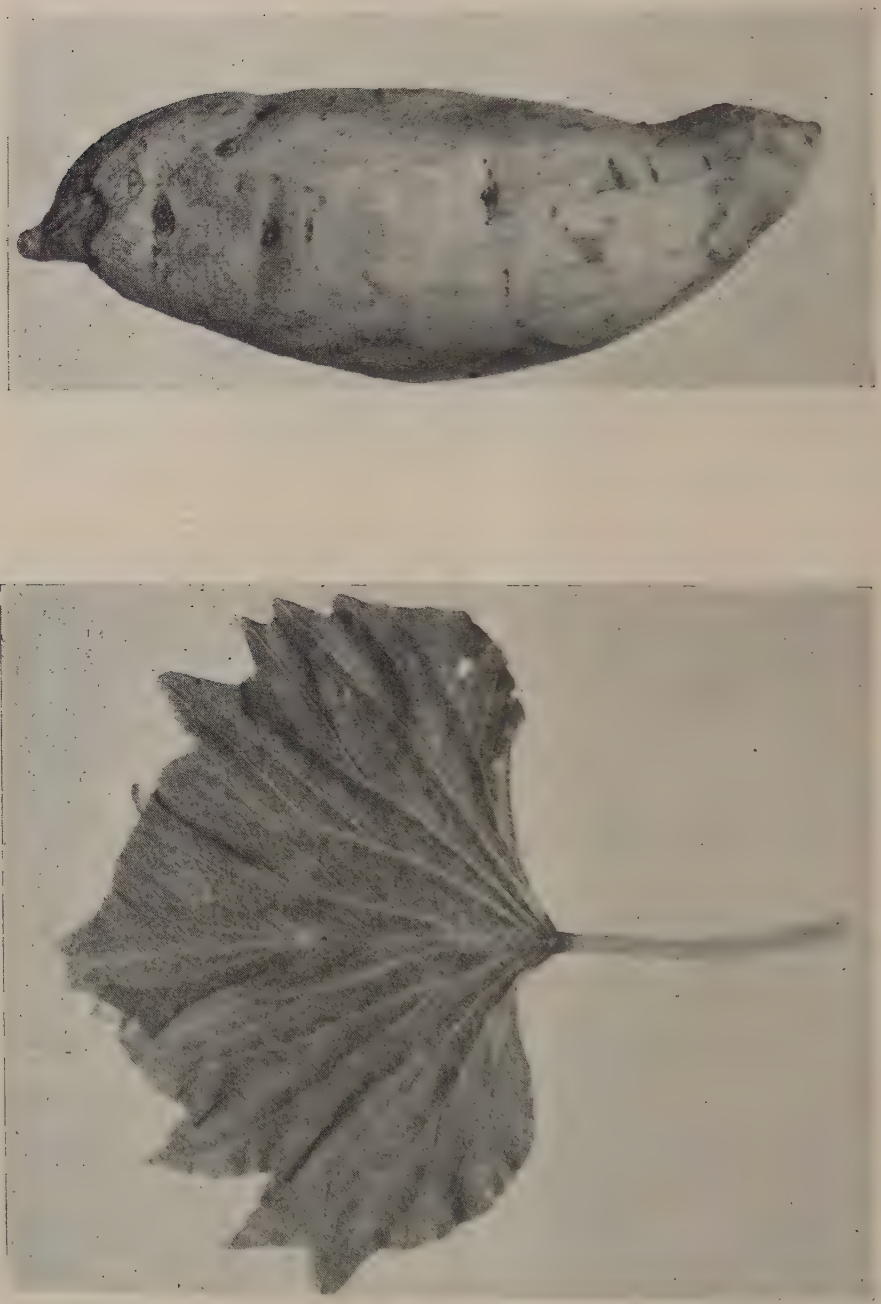


Plate 3.
BROOKS' GEM.—Tuber about 7½ inches long.

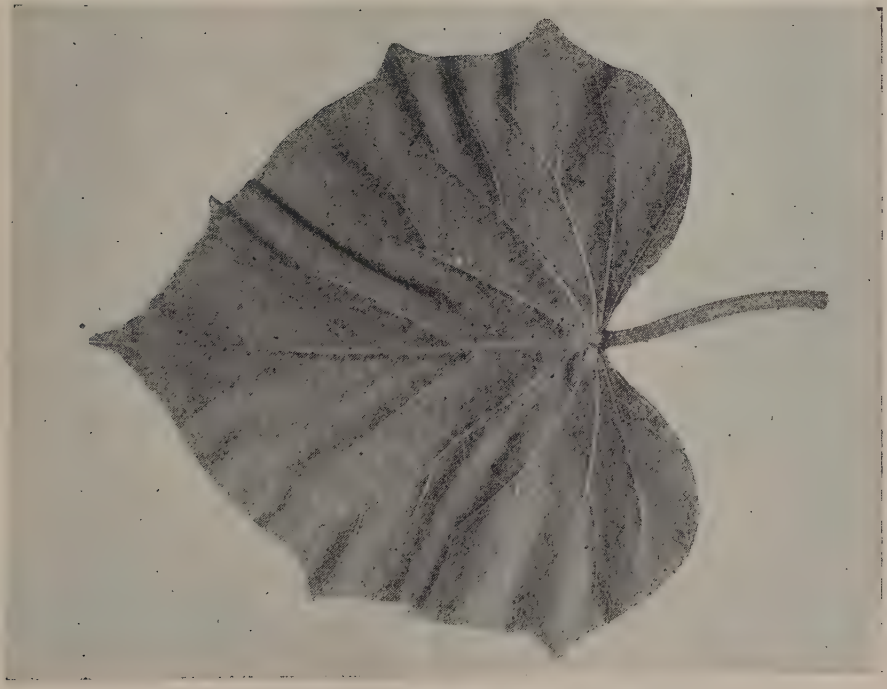


Plate 4.

LOUISIANA No. 9.—Tuber about 7¾ inches long.

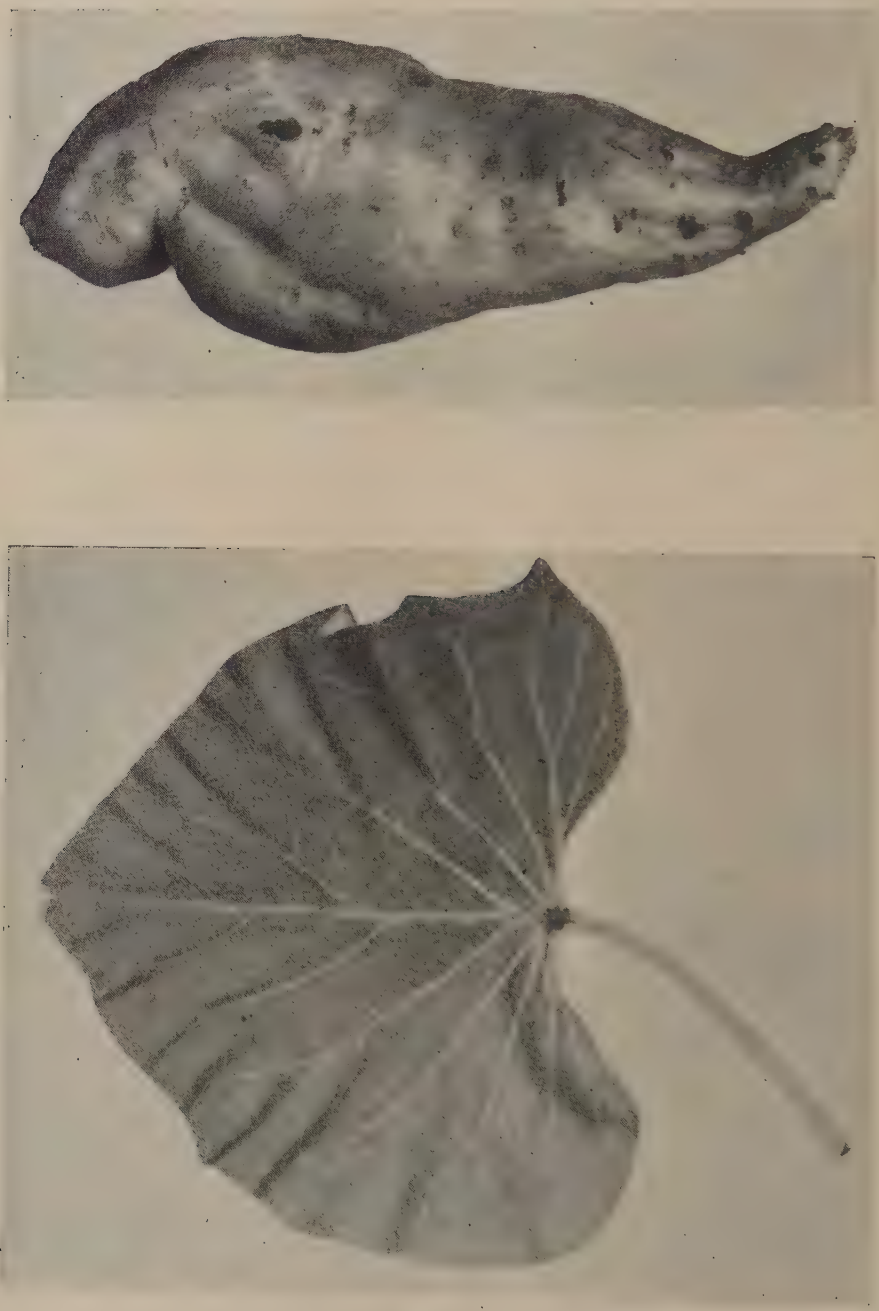
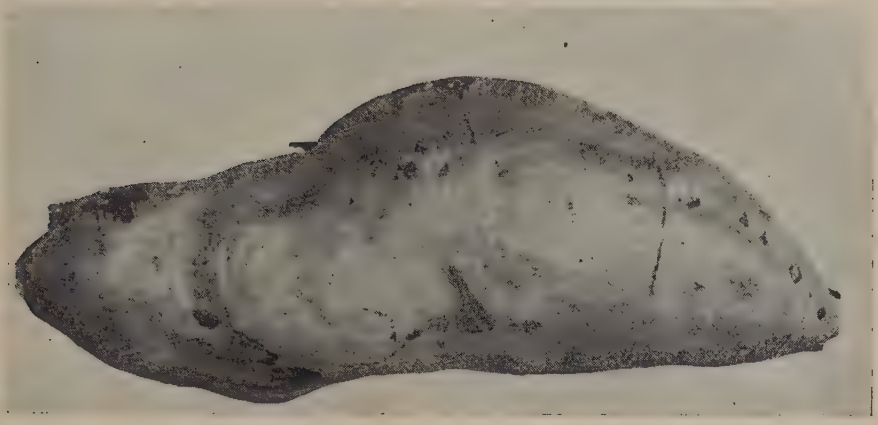


Plate 5.
NANCY GOLD.—Tuber about 8 inches long.



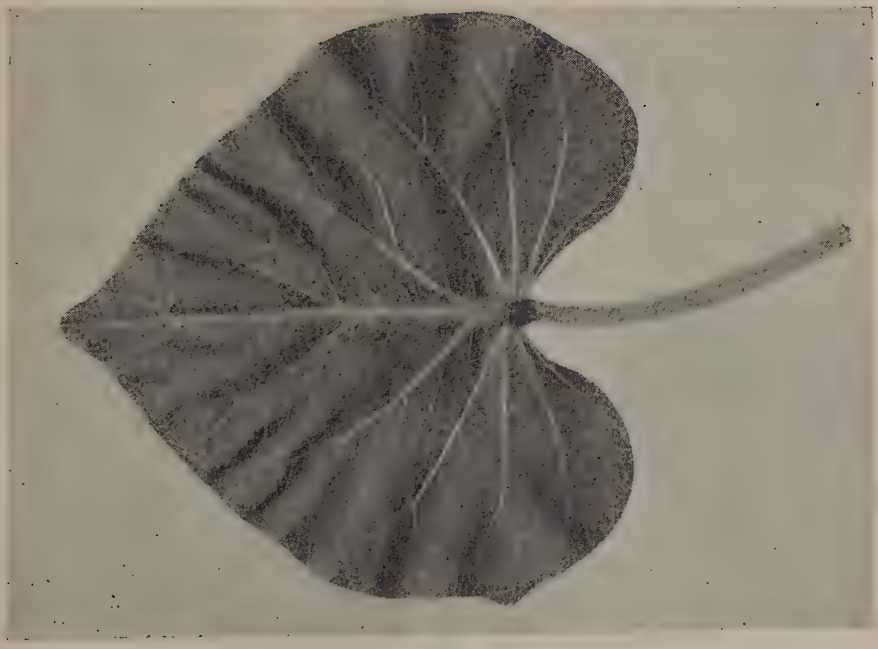


Plate 6.

NANCY HALL.—Tuber about 7½ inches long.

Plate 7.

PORTO MORADA.—Tuber about 6¾ inches long.

Plate 8.

PORTO RICO (BUNCH).—Tuber about 6 inches long.

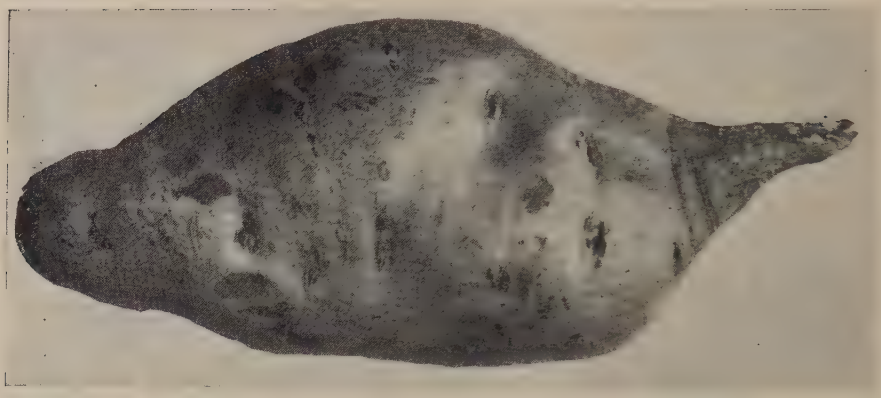


Plate 9.
PORTO RICO (UNIT 7).—Tuber about 8 inches long.

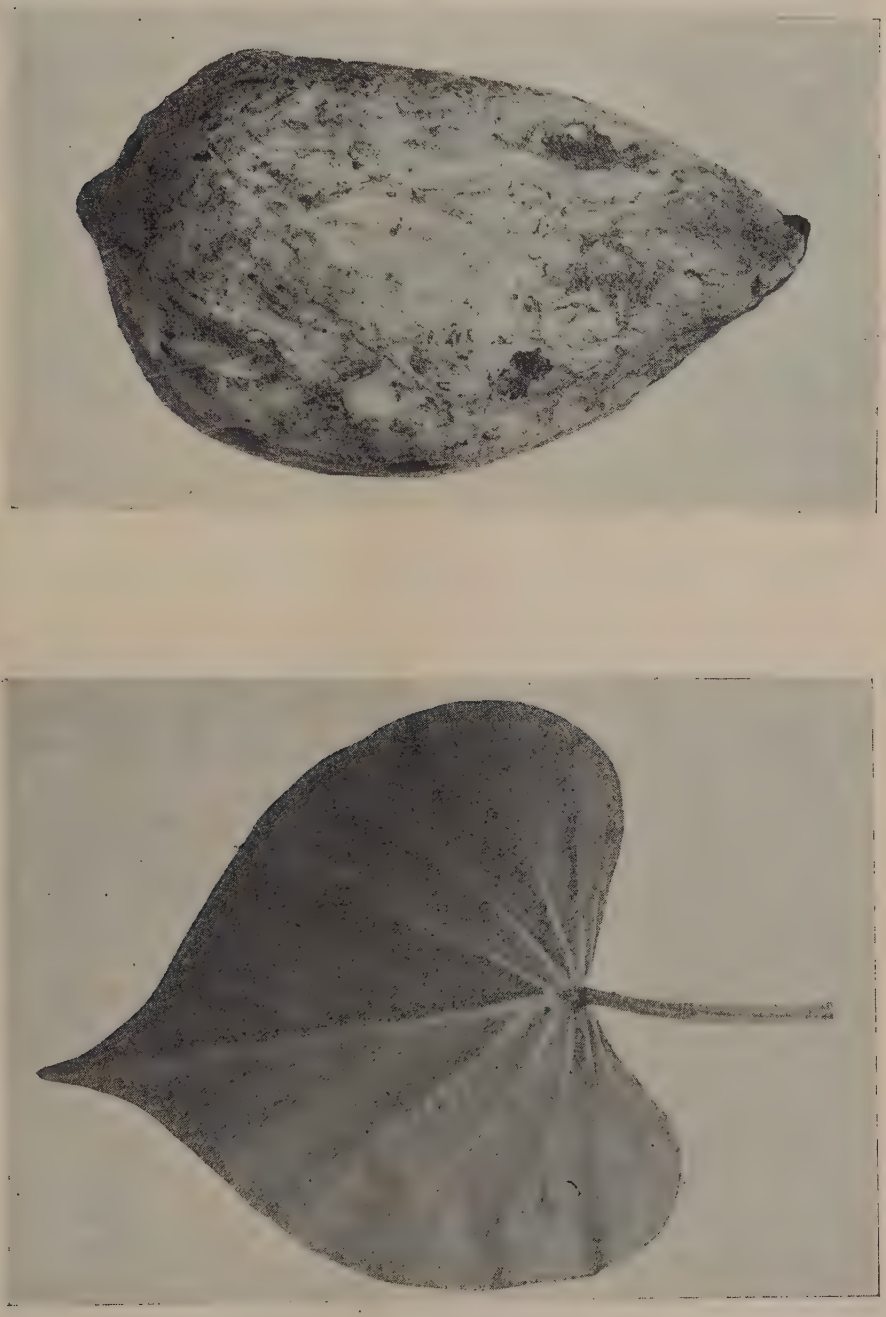


Plate 10.
WHITE MALTESE.—Tuber about 5½ inches long.

Strawberry Growing.

APPROVED PLANTING MATERIAL.

THE scheme for approved strawberry runners was initiated in 1947 with a view to reducing the incidence of strawberry virus diseases and to improve the quality of strawberry planting material generally. In 1948, a large number of growers submitted their crops for examination and, after a series of inspections, the crops of the following growers have satisfied the requirements of the strawberry-runner scheme which were published in the *Queensland Agricultural Journal* for April, 1948. Therefore, these growers may now sell their runners as "approved by the Department of Agriculture and Stock."

W. A. Wood, Image Flat road, Nambour.

G. A. Armstrong, Montville road, Palmwoods.

M. L. Spackman, Palmwoods.

F. L. Rasmussen, Maroochydore road, Woombye.

T. E. Kidd, Buderim, via Woombye.

H. V. Langevad and L. Green, "Valhalla," Mains road, Sunnybank.

E. E. Couchman, Musgrave road, Cooper's Plains.

G. H. Lambly, Birkdale.

D. J. Brown, Wellington street, Cleveland.

L. H. Keating, Pinklands, via Cleveland.

C. A. Kempnich, Pinklands, via Cleveland.

G. E. Lax, Redland Bay road, Pinklands, via Cleveland.

A. H. Pateman, Pinklands, via Cleveland.

PLANT PROTECTION

Diseases of Pome Fruit in the Stanthorpe District.

R. B. MORWOOD, Senior Pathologist, Science Branch.

POME fruits, which include apples, pears and quinces, are practically restricted in Queensland to the Stanthorpe area on the high southern border of the State. Even in that district they are subjected to higher summer temperatures than are desirable and generally experience a dry spring period. These factors result in a different disease situation than occurs elsewhere. In the southern States and most overseas apple-growing areas orchardists have to contend with apple scab and other diseases caused by parasitic fungi which rely on humid conditions. At Stanthorpe the emphasis is on powdery mildew, caused by a fungus which thrives in moderately dry weather, and on physiological diseases which are the result of adverse conditions rather than attack by parasites.

Powdery Mildew.

This disease appears as a white powdery coating on the surface of leaves, particularly affecting the group of young leaves surrounding a developing bud. Leaves tend to curl and become contorted, the affected areas later drying out to a condition known as scorch, in which stage the disease resembles spray injury. When a bud is thickly coated with mildew it fails to develop fully and, as the season advances, such buds and twigs dry out and die back (Plate 11). Leaf scorch, defoliation and twig dieback result in a general decline of the tree, with reduction in the production of fruit and general unthriftiness. These effects are more severe on trees which are in poor condition for other reasons, such as neglect of cultural operations.

The mildew consists of the minute threads and spores of a fungous parasite.* Like the organisms causing other powdery mildews it differs from the majority of parasitic fungi in developing on the outside of the host. This should make control simple, but actually the fungus is difficult to deal with in the dormant season as at that stage the fungus penetrates between the undeveloped leaves in the bud. From such initial sources of infection the fungus develops with the bud and infests the resultant leaves. It then produces countless spores which blow about to produce new infections.

The control of powdery mildew commences with the removal of obviously affected twigs when pruning. There will still be a number of infections escape, so that it will be necessary to use sulphur sprays to deal with the subsequent spread. Removal of badly affected laterals could be continued during the summer with advantage, particularly on lightly affected trees.

* *Podosphaera leucotricha* (Ell. & Everh.) Salm.

Plate 11.

POWDERY MILDEW OF THE APPLE.—Note the white fungal growth and resulting dieback.

At the pink stage all susceptible trees should be sprayed with lime sulphur, 1 in 30. This should be followed by the use of wettable sulphur (5 lb. 100 gallons) after the fruit has set. The number of sprayings will vary with the severity of the disease, as many as four being necessary in some cases at intervals of three weeks. For economy these should be combined as far as possible with codling moth cover sprays. Varieties of apples vary in their susceptibility to powdery mildew to such an extent that it is frequently regarded by orchardists as a disease of Jonathans only. The Rome Beauty variety is equally susceptible, with Gravenstein and Kirk David somewhat less so. Granny Smith trees are normally practically immune, but have been known to carry a fair degree of infection when adjacent to neglected Jonathan trees.

Black Spot or Scab.

This disease is the most severe trouble of apples in other areas but it is kept in control by unsuitable climatic conditions at Stanthorpe and is seldom encountered. The disease, which is characterised by scabby blemishes on the fruit, is caused by a fungus* which also produces a leaf spot. The corresponding disease on pears, caused by a closely related fungus,† is unfortunately able to survive at Stanthorpe and requires the application of control measures. It appears as black spots on the young leaves, fruit and small twigs. Control is readily obtained by the use of copper sprays, but some compromise is necessary as sprays applied after fruit set tend to produce russet.

All fallen leaves should be ploughed under or buried by digging, infected prunings burned, and the following spray schedule used:

(*a*) At green tip, Bordeaux mixture 6-4-40;
(*b*) At open cluster, Bordeaux mixture 2-3-40;
(*c*) At calyx stage, Bordeaux mixture 2-3-40.

Prepared copper sprays may be substituted for Bordeaux mixture. Application (c) may be omitted if the disease is not severe.

Armillaria Root Rot.

Plate 12.
ARMILLARIA STRANDS ON AN APPLE ROOT.

Trees affected with this disease first show a general unthriftiness and slow decline, which may extend for several years before the trees succumb to its effects. Naturally these symptoms can easily be confused with those of trees showing poor growth from other causes, but armillaria root rot can be readily distinguished by examination of the roots. The long strands of the fungus‡ concerned, resembling black bootlaces, can be easily seen on affected roots (Plate 12). These serve to spread the fungus along roots or from root to root. From these minute fungal threads then penetrate the root and set up decay. When rotting affects many main roots or the base of the trunk, the severe effects of the disease can be seen in the starved aboveground parts.

The fungus under certain conditions produces mushroom-like fruiting bodies above affected roots, but the spores from these are not the usual method of spreading the fungus. Armillaria, as it is generally known to orchardists, is found on the roots of native trees and it is from the remains of these left on clearing that it spreads to the orchard trees.

The control of armillaria consists primarily of good clearing, including the careful removal of stumps and all roots. Affected trees should have their root systems opened to the air by the removal of soil from around the crown and main roots. This should be

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* *Venturia inaequalis* (Cooke) Wint.
† *V. pirina* Aderh.
‡ *Armillaria mellea* (Vahl) Fr.

sufficient to check the spread of the fungus, but as an added precaution the exposed portions may be treated with Bordeaux mixture. Severely affected trees should not be expected to recover. Soil fumigants such as carbon bisulphide have been suggested for use against armillaria but are cumbersome to use. More recently thiuram disulphide derivatives, sometimes known as T.D.M.S., have been suggested but no details are available on their performance.

Plate 13.
CANKER OF THE APPLE.

Canker.

True cankers on apple trees consist of fungus infections of the leaders or longer laterals which result in dry cracked bark, frequently with a concentric pattern (Plate 13). The death of all leaders beyond this point follows the interference with the sap flow. A considerable number of different fungi* can produce canker in apples. They gain entrance through large pruning cuts or breaks in the limbs. As a precautionary measure, tar or a bitumen seal should be applied to all such injuries. Cankers which may be present on the tree should be cut out well below any sign of visible infection and the cut treated. If the main limb or the crotch is affected, this involves destruction of the tree. All infected parts should be destroyed by burning promptly.

* *Physalospora obtusa* (Schw.) Cooke is the most common in Queensland.

Gravenstein Gnarl.

This disease, which is frequently known to orchardists as canker, differs from true canker in that it is not caused by any known parasite and it does not involve any break or cut in the bark of the tree. It is confined to the Gravenstein variety and appears as irregular outgrowths alternating with sunken areas on the main trunk or leaders. When the growth becomes sufficiently irregular, death of one or more leaders results. There is no known cure but the severest effects of gnarl can be avoided by high-working Gravenstein on to the main framework of a tree of some other variety.

Wood Rot.

This is a disease of a similar type to canker in that it is caused by fungi* which invade large wounds. It differs from it only in that the heart wood is the seat of injury rather than the bark. The fungi concerned produce fruiting bodies in the form of brackets on the surface of affected trees. These produce numerous wind-borne spores which affect unprotected cut surfaces of the wood. This is liable to cause trouble when grafting, but with adequate care in covering the exposed wood losses are small. Control measures are the same as for canker.

Fruit Rot.

Pome fruits are liable to a large number of fruit rots, but these are known more as storage troubles than as orchard conditions. However, soft rot,† bitter rot‡ and brown rot§ may appear while the fruit is still on the tree, particularly in a wet season. With good cultural methods, careful handling of fruit and correct storage conditions, fruit losses from any of these causes should be slight.

Dieback.

Dieback is a symptom of several tree diseases rather than a specific disease. The term includes any decline of the tree which involves death of leaders or laterals from the tips downwards. Powdery mildew and armillaria root rot, to which reference has already been made, can produce dieback, but it may also be caused by bad drainage and a variety of other causes. It is one symptom of some deficiency diseases. When all the known causes of dieback are eliminated there still remains a type or dieback of the apple which cannot be explained and which appears to be bound up with still unsolved problems of nutrition of the apple tree.

Deficiency Diseases.

The apple tree in the Stanthorpe district appears to be particularly subject to diseases due to minor element deficiencies. These include little leaf (zinc deficiency) summer dieback (copper deficiency) and measles (boron deficiency). Departmental pamphlets dealing with these conditions are available.

Sour Sap.

Young trees soon after budburst in the spring are liable to a sudden cessation of development. On cutting through the bark of affected trees, a smell can be detected which has given rise to the name sour

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* *Polystictus versicolor* (L.) Fr. and *Schizophyllum commune* Fr.

† *Penicillium expansum* Thom.

‡ *Glomerella cingulata* (Stonem.) Spauld and v. Schrenk.

§ *Sclerotinia fructicola* (Wint.) Rehm.

sap. This disease is not fully understood, but making a number of vertical cuts through the bark and cambium will, if carried out promptly after the first onset of the symptoms, generally result in a renewal of normal growth.

Fabraea Scald.

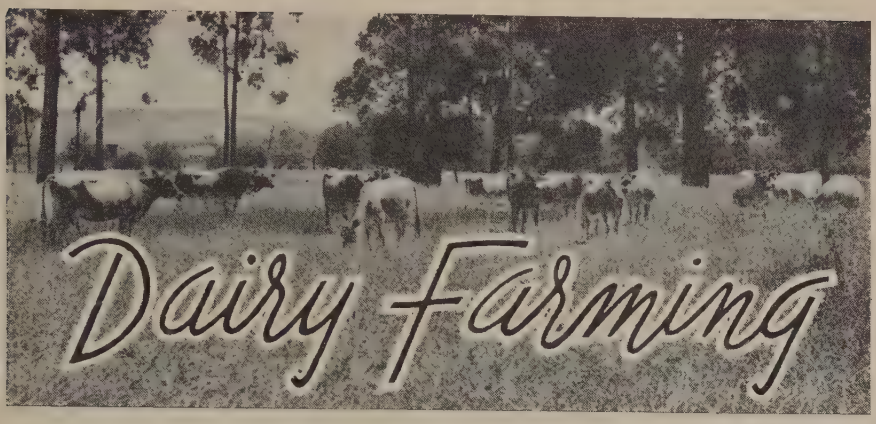
This disease is due to a fungus* which causes a dark spotting of leaves and fruit and is found principally on quinces. In wet seasons it can be so severe on that host that little marketable fruit can be picked. When fruit is infected early the black spots became corky and the fruit is stunted and distorted. The use of copper sprays in a schedule similar to that for black spot of the pear should be effective whenever it is found desirable to apply control measures.

* *Fabraea maculata Atk.*

QUEENSLAND SHOW DATES.*

Allora	February 23-24	Laidley	July 8-9
Beaudesert	May 6-7	Lowood	June 10-13
Beenleigh	September 16-17	Mackay	June 28-30
Boonah	June 3-4	Maleny	May 12-13
Brisbane R.N.A.	August 6-13	Marburg	May 13-14
Bundaberg	June 9-11	Maryborough	June 2-4
Charleville	May 18-19	Miles	April 12-13
Chinchilla	April 7-9	Millmerran	March 1-2
Clifton	February 18-19	Murgon	May 19-21
Cooyar	March 12	Nambour	July 7-9
Crow's Nest	May 27-28	Nanango	April 28-30
Dalby	March 31-April 2	Oakey	March 4-5
Esk	July 1-2	Pittsworth	March 8-9
Gatton	July 21-23	Redlands	July 15-16
Gin Gin	June 13-14	Rockhampton	June 22-25
Goombungee	May 21	Roma	May 4-5
Goomeri	May 24-25	Rosewood	July 15-16
Goondiwindi	April 30-May 2	Stanthorpe	February 3-5
Gympie	May 26-28	Tara	March 29-30
Inglewood	March 11-12	Toogoolawah	June 17-18
Ipswich	May 17-19	Toowoomba	March 19-24
Jandowae	April 4-5	Wallumbilla	April 29-30
Kalbar	May 28	Warrill View	May 21
Kilcoy	June 24-25	Warwick	February 10-12
Kilkivan	June 10-11	Wondai	May 12-14
Killarney	February 25-26	Woodford	July 15-16
Kingaroy	May 5-7	Yarraman	April 22-23

* This list is not necessarily complete, and any further show dates will be published in future issues.



Watch For These Weeds!

SOUTH Coast dairy farmers in valleys running down from the Macpherson Range, as well as those on the Springbrook plateau, have been troubled for some years past by two weeds closely related botanically but of different appearance, one being of upright habit and the other somewhat straggling.

Both occur to a slight extent elsewhere in coastal dairying areas, such as the Pine and Stanley watersheds and in the Brisbane district.

These two weeds are known by such names as Crofton weed, hemp agrimony, mist-flower and whitetop. The suggested standard common name for the upright species* is sticky agrimony and that for the other species† is mist-flower.

Sticky Agrimony.

Sticky agrimony (Plate 14) usually grows from four to six feet high and the plant has numerous upright stems with leaves 2 to 3 inches long and up to 2 inches broad at the base. The flowers are in heads very much like those of the common billygoat weed (Ageratum), except that they are white and not blue.

Mist-flower.

The straggling species (Plate 15) has white flowers very similar to those of sticky agrimony, but the leaves are of a different shape and the stems are not usually upright but straggle to some extent and root at their lower joints. The plants usually do not exceed two feet in height.

Where to Look.

Both of these weeds appear to establish first along watercourses or on shaded scrub edges, from which they spread into pastures. Coastal dairy farmers from Maleny to the border should keep a close watch for the first appearance of these weeds on their properties. They are most easily identified when in flower about August, and any plants discovered should be dug out before they seed.

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* *Eupatorium adenophorum.*

† *Eupatorium riparium.*

Plate 14.

STICKY AGRIMONY.—Plant up to 6 feet tall; flowers white, in heads like those of billygoat weed. Usually flowers in August.

Plate 15.

Mist-flower.—Straggling plant up to 2 feet high; flowers white, in heads like those of billygoat weed. Usually flowers in August.

Control Measures.

No satisfactory control measures for heavy infestations can yet be recommended. There is some prospect of at least one of the hormone weedkillers being of use in control work. There are a few of these weedkillers on the market in packages costing from three to six shillings, and with these farmers can conduct experimental sprayings at little cost. The plants should be brushed and the regrowth sprayed when a few weeks old.

Both arsenic pentoxide and sodium chlorate give fair kills of sticky agrimony and mist-flower, but the former is dangerous to use on pasture areas, and sodium chlorate is scarce and expensive.

Milking Bails—Crush v. Walk-through Type.

C. R. TUMMON, Dairy Adviser, Division of Dairying.

THE Dairy Produce Acts set out detailed instructions regarding separator room, cream room, and air space in the milking shed, but do not specifically prescribe any type of bails. This gives the farmer some option in the choice of bails. It is the purpose of this paper to point out the advantages of the double-type walk-through bails over crush bails.

The types of milking bails in use throughout Queensland vary considerably. The older types consist mainly of the head-locking bails, or combination feeding stalls and milking bails. With each of these types the animals have to "backed out" after milking, which causes unnecessary delay and confusion. These types are no longer popular and will gradually be eliminated as old buildings are replaced with new.

Various forms of race, crush or echelon type bails were at one time popular in certain districts and a few of these bails are still being constructed. Their construction is to be discouraged as their disadvantages far outweigh their advantages.

Claims Examined.

The advantages claimed by the crush-type bail are—

(*a*) *Simplicity of erection and reduction of cost.*—They may be cheaper, as most crush bails have open sides and consequently do not require side walls. However, this is a doubtful advantage, as neither the cows nor the milkers are protected from the weather during milking. If the sides are walled in, then the cost of this type of shed varies little from the double type of walk-through bail.

(*b*) *Milking can be carried out at a faster rate.*—Admittedly, a crush full of cattle may be yarded at the one time, thus avoiding bailing up of individual cows. However, as the first cow in the crush cannot be let out until the last one on the same side is milked, and as cows cannot be milked faster than the machines are capable of withdrawing the milk, it is difficult to see how faster milking can be obtained, provided there is uninterrupted milking, with either crush or walk-through bails. Usually with walk-through bails cows become accustomed to the order in which they are milked and little difficulty is experienced in bailing-up.

(*c*) *Breaking-in of heifers is facilitated.*—The use of a crush is certainly a good way of breaking in a wild heifer, but well-constructed walk-through bails are quite capable of doing the job. In any case, a separate crush could be erected for many uses on a farm, including the breaking-in of heifers. It should be remembered, however, that if calves are well handled, bucket fed, and kindly treated when young (as they should be on a well-managed farm), the breaking-in after calving presents no difficulty.

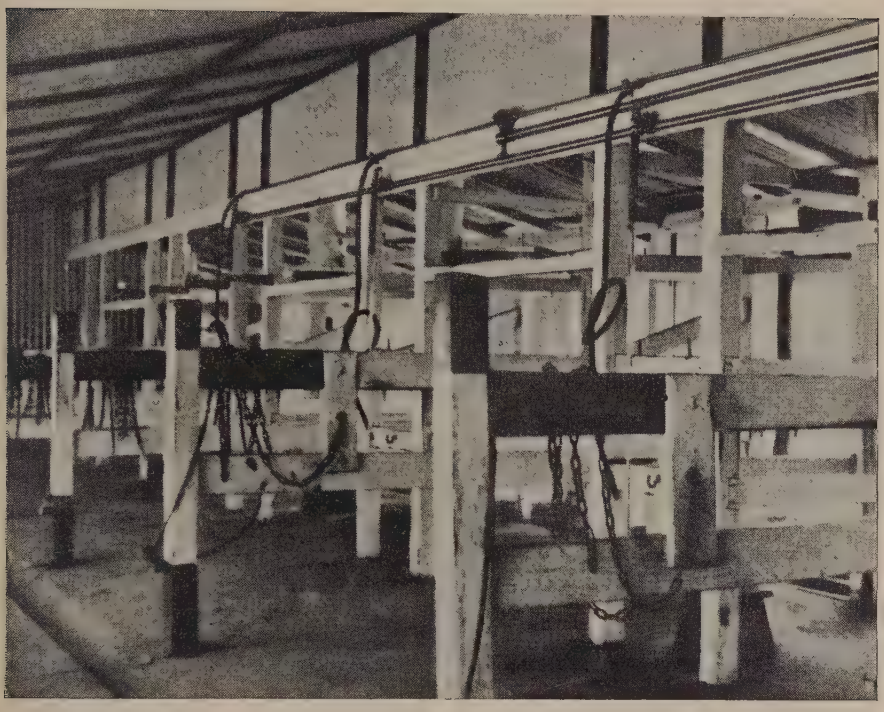


Plate 16.
Soundly Constructed "Walk-through" Bails.

Disadvantages of Crush Type.

Now that the advantages claimed for the crush type of bail have been reveiwed, it is desired to point out the disadvantages. They are:—

(*a*) *Difficulty in hand feeding.*—Admittedly it is not the best practice to hand-feed cows in milking bails, and separate feeding stalls should be provided. However, most farmers know that when cows are fed in outside stalls, they are inclined to be somewhat fidgety in the bails whether fed before or after milking. Therefore, the feeding of a little concentrate in the bails prevents cows from "holding-up" their milk. It is an easy matter to hand-feed this small quantity of concentrate in the walk-through type of bail but it is well-nigh impossible to do so with the crush type.

(*b*) *Danger from kicking.*—There is much more danger of the milker being kicked in the crush bails as the bottom rail is about 2 feet 6 inches off the floor and no provision can be made for leg-roping. It is realised that in most cases leg-roping is an undesirable practice, but it is necessary with some animals.

(*c*) *Upsetting of cows with consequent "holding-up" of milk.*—With crush bails, if one animal is nervous and upset she can move about and upset the whole crush-full, causing a "hold-up" in milk of all the cows concerned.

(*d*) *Difficulty in handling individual cows.*—Probably this is the most important reason of all. It is known that cows respond to kind treatment and individual handling and this cannot be achieved so successfully in the crush type of bail. Additionally, if a cow has a bail to herself it is an easy matter to treat her for any particular ailment at milking time

(*e*) *General appearance.*—The general appearance of crush bails, being more of a skeleton type, compares unfavourably with the approved walk-through type which can be nicely painted and made to look a wholesome place for the production of milk.

(*f*) *Difficulty in cleaning.*—The two lines of rails down the middle of the building make it difficult to clean crush bails, and often the manure is merely pushed to either side until an undesirable heap accumulates.

(*g*) *The movement of milkers is hampered.*—Milkers are hampered as they have to work in the centre passage where milk lines extend from the centre overhead to either side.

(*h*) *Non-compliance with the Act in some cases.*—In some cases where crush bails are erected they do not comply with the Act, inasmuch as the exit space at the head of the crush is regarded as the air space required and the engine and pump are then placed in the separator room, whereas an additional air space of six feet should be provided to house such engine and pump.

From the foregoing it is hoped farmers will be discouraged from building any crush-type bails. Farmers contemplating the erection of new milking sheds are strongly advised to discuss the site, drainage and kind of building with the local dairy officer, whose advice and experience are always at their disposal. Moreover, this will avoid any risk of alterations having to be made to buildings to enable them to comply with the Act.

DEVELOPMENT OF GRAZING LANDS.

The Bureau of Investigation under *The Land and Water Resources Development Acts, 1943 to 1946*, in its last annual report emphasises that expansion of production in the extensive pastoral areas of the State can only be obtained by developing existing holdings, since there is very little suitable pastoral country not now occupied.

The three main developmental factors are set out as:—

(1) Substantial improvements in fencing and water facilities to assist better management on individual holdings;

(2) Cultivation of fertile areas in the reasonably good rainfall belt; and

(3) Irrigation, where feasible.

The Bureau is co-operating with the Department of Agriculture and Stock and the Department of Irrigation and Water Supply in testing of pastures and fodder crops under irrigation.

DIVISION OF DAIRYING.

GROUP HERD RECORDING SCHEME.

SUMMARY OF HERD RECORDING UNITS FOR NOVEMBER, 1948.

District.	No. of Herds in Group.	No. of Cows in Group.	Daily Average for all Cows in Group.			Average of Highest Herd in Group.		
			Milk. Lb.	Test. Per Cent.	Fat. Lb.	Milk. Lb.	Test. Per Cent.	Fat. Lb.
Beaudesert	17	818	15·2	4·03	·618	21·1	4·71	·995
Maleny, No. 1	19	803	13·87	4·45	·617	18·4	5·13	·943
Maleny, No. 2	15	664	13·3	4·48	·596	26·76	4·71	1·262
Oakey, No. 1	22	722	17·01	4·26	·724	23·22	5·27	1·223
Oakey, No. 2	22	715	17·81	4·1	·73	28·81	3·72	1·073
Allora	13	348	19·06	4·31	·822	30·5	3·97	1·21
Goomeri	18	628	13·21	3·97	·524	17·34	4·37	·758
Cooroy, No. 1	22	746	10·82	3·92	·424	24·25	3·93	·954
Cooroy, No. 2	21	601	9·28	3·8	·353	13·5	3·3	·445
Kingaroy, No. 1	20	712	14·97	3·86	·578	26·91	4·09	1·101
Kingaroy, No. 2	19	678	13·95	3·69	·514	18·14	3·78	·687
Cedar Pocket	21	539	12·9	4·01	·518	19·58	4·39	·859
Monto	21	703	17·55	4·07	·714	28·8	3·64	1·05
Pomona	19	699	10·58	3·85	·407	17·1	4·04	·69
Miva–Theebine	17	661	9·25	3·96	·366	15·99	4·26	·68
Warwick	21	685	21·35	3·81	·814	30·05	4·04	1·214
Kenilworth	18	741	13·65	3·95	·539	26·12	3·43	·897
Killarney	19	796	17·8	4·12	·733	19·9	4·88	·971
Toogoolawah	16	723	13·53	3·78	·511	22·09	3·74	·826
Toowoomba, No. 1 ..	24	750	14·71	4·18	·614	19·44	4·35	·846
Toowoomba, No. 2 ..	13	603	14·83	3·93	·583	26·74	3·75	1·002
Malanda	22	755	14·43	3·7	·535	26·4	3·6	·951

Fat Lamb Production in Queensland.

G. R. MOULE, Officer in Charge, Sheep and Wool Branch.

(*Continued from page* 365, *December*, 1948.)

SHEEP BREEDING FOR LAMB PRODUCTION.

The Mutton Type of Sheep.

A square, blocky, low-set symmetrical appearance is typical of the mutton sheep. Associated with this in most cases is a short, broad head. As the neck is a low-priced cut it should be short and thick and should blend well into the shoulder. The shoulders should be broad and fitted evenly against well-sprung ribs. Loose, open blades and flat, long shoulders, so often associated with a peaked wither, are not popular as they are considered to indicate thinness of fleshing throughout the carcase.

It is important that the ribs be well sprung to give a broad, even back. Excessive depth of chest is not desirable, particularly when it is present at the expense of width of back. It should be remembered that the brisket and the lower extremities of the lambs are low-priced cuts, but at the same time the legs should be squarely set and the feet good.

The most valuable part of the carcase is the loin, which should be broad and thick. This thickness should come from an even covering of deep flesh. Length and depth of fleshing are not usually associated in sheep, but depth of fleshing is considered to be the more important. Accordingly, thickness and close coupling of the loin are most desirable characteristics provided they are not over-developed. This would make the sheep short and dumpy.

The rump should be well rounded at the base of the tail but otherwise broad and level and should be carried down to well-muscled thighs. The length of the rump should be sufficient to maintain symmetry and at the same time give balanced proportions for a good leg of mutton—an important and valuable cut. The meat should be carried down to wide-set straight hocks and to get this the quarter must be well turned.

Balance and symmetry in the live animal are usually associated with an ideal carcase. Coarseness, over-development, or under-development of any one part will upset the balance of the animal and detract from the value of the carcase.

The covering of flesh is an important feature of any mutton sheep. It should be firm and even and show no indication of hardness or soft, blubbery lumps. These defects are most likely to occur on the lower ribs, at the base of the tail or on the margin of the loin.

Pure Breeds.

In Queensland the sheep population is predominantly Merino. British breeds are not well established numerically and this has led to an acute shortage of suitable crossbred ewes for fat lamb mothers. Before discussing the crossbreeding policy which it is advisable to follow the breeds of sheep will be described.

Australian Merino.

With the Merino, wool is the first consideration, and because of its conformation the carcase is not particularly suitable for a high-class mutton trade. Merinos grow slowly compared with British breeds and their crosses. When they do mature they are comparatively small framed and lack depth of fleshing. Further, they do not milk as well as British sheep nor do they give the same high lambing percentages. Merinos do not adapt themselves readily to the agricultural environment in which lambs are produced and they seldom become as quiet and tractable as other breeds.

Long-woolled Breeds.

The Border Leicester.—The Border Leicester breed was developed in the "border" country about two centuries ago by pupils of the famous Robert Bakewell. It is a hardy breed of sheep and in Australia is more commonly found in the comparatively drier areas. It is used widely and to great advantage in western and north-western New South Wales and it is one of the most popular British breeds in Australia.

Border Leicesters are particularly suited for mating with Merino ewes in marginal lamb country to produce "summer" lambs and crossbred ewes for use as "sucker" lamb mothers. The half-bred ewes are particularly suitable for this purpose, as they are prolific and are good milkers and enjoy great longevity.

Plate 17 shows a ram typical of the Border Leicester breed, and the standard as laid down in the Flock Book for British Breeds of Sheep in Australia is as follows:—

Head—Medium sized, smooth crown, wide in forehead, full and even down the face to a slightly Roman nose, perfectly free from wool and covered with pure white soft hair, though occasionally a black spot will appear. Face—Strong jaw and clean cut; nostrils wide and dark. Eyes—Full and prominent, but mild and placid. Ears—Lively, mobile, medium-sized and semi-erect; white inside and out, though black spots sometimes appear with age. Neck—Tapering nicely from the head and strongly set on at the shoulders. Shoulders—Wide, with plenty of heart room. Chest—Broad, deep and well formed. Back—Straight, level and broad. Ribs—Well sprung in a fine circular arch, more attractive for width than for depth. Hindquarters—The loin should be wide and firm, and the quarters long and deep. Legs—Squarely set under, well apart, falling straight from the body, medium length, strong, with clean, flat bone, covered with perfectly white hair and quite free from

Plate 17.
A BORDER LEICESTER RAM.

wool; dark hoofs preferable. Skin—Pink and mellow to the touch. Carriage—Free and noble in appearance. Fleece—The whole body should be evenly covered with a soft-handling and lustrous wool, comparatively fine, with a staple of commanding length and with a nice undulating crimp; the latter should run right to the tip, where the fleece must show uniform curl. General appearance—The shoulders should slope gently to the ribs and thus avoid narrowness around the heart; the back should be evenly covered with flesh firm to the touch; and the underline should be almost as straight as the back. The animal should be evenly and symmetrically balanced at every point, with the result that it will be able to move freely and carry itself in a gay and majestic manner.

Romney Marsh.—The Romney Marsh breed was evolved under damp conditions in Kent and its strong constitution is well recognised.

Marked improvement in conformation and wool production was wrought by New Zealand breeders, who have produced a short-legged type that shows more refinement, symmetry and deeper fleshing than the original Romneys, but which still retains the constitution of the breed, making it particularly adaptable to cold, wet conditions.

Plate 18 shows a typical "modern" Romney and the official breed description is as follows:—

Wide head, level between the ears, which should be large and thick and covered with fine hair, or preferably partially covered with a soft, downy wool, a good thick foretop, and no horns or dark hair on the poll, which should be covered with wool. Eyes should be large, bright and

Plate 18.
A Romney Marsh Ram.

prominent, the face in ewes full, not too white, and in rams broad and masculine in appearance. The nose in all cases must be coal black. The neck should be well set in at the shoulders and strong and thick, the shoulders wide, well put in and level with the back. (High-shouldered sheep are bad travellers, and a drop behind the shoulders, though to some extent characteristic of the breed, spoils many an otherwise good sheep). Chest wide and deep. Back straight, with wide and flat loin, ribs well sprung, loin of good length, and rump wide, long, and well turned. Tail set in almost level with the chine, a low-set tail being objectionable, as ewes with that defect often fail as breeders. Belly fairly let down and flank well developed. Thighs well let down and developed, a most important point. Legs should be set well apart, short, plump and ham-shaped, with big bone and large, shapely feet of black horn. Although black feet are preferable, there is usually a considerable proportion of light-coloured feet in every Romney flock, and a really good sheep should not be condemned on that account. It is often stated that Romneys with light-coloured feet suffer more from footrot than those with black, but such has not been the general experience.

The fleece should be of dense, even quality, and of a good, decided staple from the foretop on the head to the end of the tail. The wool should be even in length from the head to the tail, and free from kemp (a white hair which will not work up in material or absorb dye). Of course, the best part of the fleece is found on the fore-end of the sheep, but it should be the aim of every breeder to produce a covering as even as possible. A good covering of wool on the back is essential and when

grasped should fill the hand, not feel thin and weak. The fleece should be of good length, open freely, be crimpy from skin to tip, lustrous and soft, have a dense feel, and be free from cross fibres. The skin should be of a clean, pink colour, a sign of health and good constitution.

Corriedale.—The Corriedale is usually regarded as a utility breed—that is, it combines valuable mutton and wool characters. This breed was developed in New Zealand some 70 years ago and the most successful foundation cross seems to have been the Lincoln and the Merino. The progeny were inbred and heavy culling was practised. A distinct type has now been established and the breed has become popular in areas where agriculture and/or pasture improvement are practised. The type of sheep most desired has a large frame and is of good conformation. It is a heavy cutter and the wool is usually of a 50–56's quality and is of distinctive style and character.

Plate 19 depicts a good quality Corriedale ram, and the following description may be taken as giving a general idea of the points of the breed:—

General Appearance.—The Corriedale should at once give the impression of being a well-woolled and evenly-balanced sheep of remarkably hardy constitution, the ram of distinctive character and bold outlook. Being a dual-purpose sheep, consideration should be given to both wool and carcase.

Head.—Hornless, broad, strong, well-woolled, but free from wool blindness. Black or blue spots on the ears are no defect, but black or brown spots on hair or wool are faults. Wide-open nostrils, black for preference.

Plate 19.
A CORRIEDALE RAM.

Neck.—Broad and strong, forming a good scrag. *Back.*—From neck to rump long, level, and broad. *Brisket.*—Deep and wide. *Ribs.*—Well sprung and deep. *Hindquarters.*—Well apart, deep and broad, and well let down towards the hocks. *Legs.*—Moderate length, with good bone, set straight and well apart. The hoof should be of fair size, well formed, and preferably black in colour.

Wool.—The Corriedale should carry a heavy, even fleece of good length, dense staple, pronounced crimp, and a level tip. The quality aimed at is a long-stapled, dense, bulky 50's–56's, but a somewhat lower spinning grade, especially in a ram, is not to be discriminated against. A characteristic of the pure Corriedale sheep is the remarkable evenness in the length, density, and quality of the fleece throughout. In the males the purse should be covered with wool, not too coarse or hairy in texture.

When buying Corriedales the purchaser should see that the jaws are neither undershot nor overshot. Sheep with horns (other than button-horns not firmly attached to the skull, which are permissible but not desirable) should be discarded. When the buyer has satisfied himself as to the wool he should look to the conformation and carefully handle the sheep, commencing at the neck. See that the "scrag" is broad and strong, that the shoulder blades are wide apart, and that there is no "devil's grip." The ribs immediately behind the shoulder should be well sprung and in conformity with those further back. There must be no dip behind the shoulders or hollow in the back, and the loin and the hook bones must be wide, with but little droop thence to the tail-head. Arms and thighs should be wide and deep and come well down towards the knees and hocks.

Plate 20.
A SOUTHDOWN RAM.

Short-woolled Breeds.

Southdown.—The Southdown is regarded as one of the oldest pure-bred sheep in Britain. It is the smallest of the Downs breeds and makes an excellent sire of export lambs. It is usually considered that the Southdown should be used in areas where conditions are good. This is because it is an early maturing breed—that is to say, young animals of this breed or sheep carrying an infusion of Southdown blood have the proportions of bone, muscle, and fat which are found only in mature animals of most other breeds. It is clear from Plate 20, which shows a typical Southdown, that the breed to-day is built more or less on the lines of a box, the "box" being set squarely on legs at each corner. The feet are not as large as those of the Romney but should be reasonably big—a narrow, pointed foot being undesirable. The pastern should be strong, and set so that the sheep can move. A straight pastern is not wanted. The bone above the pastern need not be big but should slope back like the shoulders of a good horse, while the shoulder should be flat and wide on top, the back strong and wide, and the loin flat. The ribs should turn well out and the rump should be flat and square to the tail. The sheep should not slope down at the rear end but should go straight down, with plenty of bulk in the hind legs.

Constitution and adequate heart room are most essential. The neck should be set in exactly with the shoulder and must be broad, strong, and short. The poll should be flat, the head wide and flat between the eyes, and the face not too long with broad, open, wide nostrils. The underjaw must be deep and strong, coming up squarely with the teeth neither overshot nor undershot, either of these defects being a culling point.

The approved colour of the face is a soft, mousy tint. The colour may be darker or lighter but should be even on head and feet. The poll should carry no horns; the ears should not be too large and should have a nice "handle." The flesh should be soft but firm, while the wool, though a secondary consideration from the utility point of view, must be dense, fine, and even all over. The sheen of the skin when the wool is opened is very important. On any young sheep it should be "baby" pink in colour. Southdown mutton is of excellent quality but it can easily be fed too fat.

As a pure breed the Southdown may be a little difficult to manage, as the sheep can become cast quite easily.

Dorset Horn.—The Dorset Horn has a special role in the lamb industry in Queensland for the siring of very early crossbred lambs. The young sheep grow very quickly. Quick growth rate is not to be confused with early maturity. Although the Dorset Horn and Dorset Horn crosses grow very rapidly the bone, muscle, and fat composing the carcase of these sheep do not necessarily reach the proportions of maturity at an early age. However, the modern Australian Dorset Horns, which are probably as good as any in the world, have a marked tendency towards early maturity. It is stated that the rams will work more actively and earlier than those of other breeds, but the breed's weaknesses are in its longish carcase, high, open shoulders, and a tendency towards deficiency of rib and hindquarter. In Queensland the capacity of the Dorset to grow rapidly and its adaptability make it an extremely useful breed.

Dorset Horn Merino crossbreds are particularly good fat lamb mothers, but they do not produce a very valuable fleece, and this is an unfortunate, but important, deficiency.

Plate 21.
A Dorset Horn Ram.

The Dorset ram shown in Plate 21 is bold and masculine in appearance, horns strong and long, growing from the head well apart on the crown in a straight line with each other, and coming downward and forward in graceful curves as close to the face as may be without necessitating cutting. In the ewes the horns should be much smaller and more delicate. The general characteristics are—head broad, full and open at the nostril, well covered with wool from brow to poll, face white, with pink nose and lips; ears of medium size and thin; neck short and round, well sprung from the shoulder, with no depression at the collar, and strong and muscular, especially in the ram.

Crossbreeding for Lamb Production.

The two most important factors in fat lamb production are correct breeding and correct feeding.

The following are the characteristics which are important in ewes selected as fat lamb mothers—

(i) Suitable conformation; that is the ewes should be big, square framed and roomy with well formed udders and a tendency towards depth of fleshing.

(ii) Prolificacy; that is, they should produce a large number of lambs during their breeding life. This means that they should have twins in at least some years.

(iii) A long breeding season and capacity to mate early.

(iv) Good maternal and milking qualities.

(v) A temperament suited to an agricultural environment.

(vi) Production of a fairly valuable fleece.

It is necessary to use Merino ewes in any programme of lamb production in this State and the way in which this might be done depends upon the trade for which the lambs are being produced. For the export trade, in which overseas competition must be met, it is preferable to cross Merino ewes with long woolled rams and use the female offspring as fat lamb mothers. The male offsprings make quite good lambs for the local trade. The most popular first-cross ewes are Border Leicesters x Merino and Romney Marsh x Merino. The latter are more popular in the heavier rainfall areas.

The Corriedale x Merino cross makes quite a good lamb mother. These sheep are usually considered to have a slightly longer breeding season than the Romney Marsh or Border Leicester cross. They also cut a heavier and more valuable fleece, but the lambs are not quite as good in conformation. These ewes are preferred by some breeders in riskier districts as they produce quite good "carry-over" lambs. Pure Corriedale ewes make good lamb mothers but are rather expensive for such a purpose.

The selection of the breed of rams used to mate with crossbred ewes to sire fat lambs is important because particular breeds make a definite contribution towards the conformation, growth rate and suitability of the lambs for their environment. The Downs breeds combine most of the desirable characters and of these the Dorset Horn and Southdown are particularly suited to Queensland conditions. It is usually considered that the latter breed excels for the production of high-grade lightweight export lambs. Some lamb growers contend, however, that Southdown lambs demand ideal conditions, otherwise they are inclined

Plate 22.

A GROUP OF EXCELLENT QUALITY EXPORT LAMBS SIRED BY SOUTHDOWN RAMS.

to have the proportions of maturity before they reach a suitable weight for slaughter. If the lambs are held to allow them to reach this weight they lay down an excessive amount of fat and most of this is deposited on the lower part of the ribs. Such a carcase is not suitable for a high class lamb trade.

Lambs sired by Dorset Horn rams grow very quickly and this is an advantage under Queensland conditions where crops are utilised for lamb fattening. They are also readily adaptable to the agricultural environment and the rams are not likely to be cast as are the Southdowns.

For the local trade the crosses described above will give the best quality lamb, but for a number of reasons producers may not be able to follow such breeding practices.

When wool prices are high the value of the fleece cut by Merino ewes is sufficient to ensure their popularity on most farms. In addition, they have a particular attribute in the marginal lamb country in that their wool clip is generally good even if the season is so unfavourable that it is not possible to grow crops to produce lambs. On the other hand, when wool prices are low Merino ewes are the cheapest "breeding unit" to buy and Merino wool usually brings more than crossbred wool does on the open market.

Accordingly, a large number of lambs produced in Queensland are from Merino ewes and are sired by rams of one or other of the English breeds or Corriedales. If the lamb-raiser wishes to use Merino ewes as mothers and sell all the offspring as fat lambs he would be well advised to use Dorset Horn rams as sires. On the other hand, if he wishes to rear some of the female offspring for sale as fat lamb mothers or as replacements in his own breeding flock it would be preferable to mate the Merino ewes with Corriedale, Border Leicester or Romney Marsh rams.

However, the practice of retaining a portion of the female drop as future replacements in the flock to serve as lamb mothers cannot be generally recommended. Very often it is the slowest growing "tail enders" which do not reach a marketable weight within a reasonable time that are retained in the flock. This means that the farmer is selecting for *slow* growth rate rather than for the *rapid* growth rate which is so desirable. Such a practice cannot be condemned too roundly.

As the land in the lamb-growing areas is valuable it is uneconomic to grow crossbred ewes in these districts. Accordingly there is a good opportunity for some sheep-raisers in Queensland to establish themselves as producers of crossbred ewes. These sheep are in fairly steady demand and accordingly the market does not fluctuate to the same extent as does that for Merinos.

PRINCIPLES OF LAMB PRODUCTION.

The Growth and Development of Lambs.

The rapidity of growth and the type of development of the lamb both prior to and subsequent to birth are important as they influence, in a very material way, the commercial return the farmer will obtain from his annual turn off of lambs.

The relationship between liveweight and age is shown in Plate 23. It is seen that the lamb develops slowly at first but shortly before birth is making more rapid growth. Growth reaches its maximum rate soon

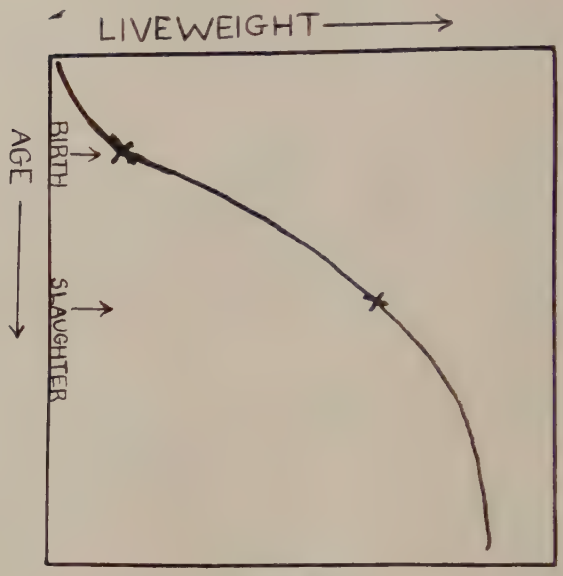


Plate 23.
RELATIONSHIP OF LIVEWEIGHT TO AGE.

after birth, but it decreases as maturity is approached. The basic principle of lamb production is to utilise that period of most rapid growth rate to maximum advantage, and slaughter should take place before or just at the point where the diminution in growth rate commences.

During the time the lamb is developing within its mother its head and forelimbs make more rapid growth. It is usually considered that there is a "growth centre" in the head and this ensures the initial development of this part of the animal. What might be likened to "waves of growth" spread downwards from the head. Other "growth centres" are located in the limbs and these ensure rapid development of these organs so that when the lamb is born it is virtually all head and legs. The growth waves spreading up from the limbs and those coming down from the head finally meet in the loin of the animal and this part is thus the last to develop. Heavy development of the hindquarters and the more valuable cuts of meat they contain has become a characteristic of some breeds of sheep as the result of domestication and selective breeding, but even now adequate feeding is necessary to develop these desirable features. It also ensures heavy birth weight and rapid growth rate of the lambs, which are desirable characters.

Factors Affecting Birth Weight.

Every sheep farmer knows that size, weight and shape of lambs vary considerably at birth. There are variations between breeds and within breeds. The observant sheep man will probably be able to suggest a connection between the size and age of the ewe and the size of her lamb. The number of lambs born to one ewe—that is, either twins or singles—and the way in which the ewe was fed during pregnancy also have an important influence on the birth weight of lambs.

Some interesting figures, which demonstrate the differences in the birth weight of lambs from different breeds, have been obtained in New Zealand. They are as follows:—

Merino (singles)	7·7 lb.
Southdown	8·6 „
Corriedale	10·1 „
Romney Marsh	11·9 „

In a series of experiments conducted in Western Australia, lambs from Merino ewes sired by Dorset Horn, Shropshire and Southdown rams averaged 8·8 lb. at birth. The lambs from Border Leicester x Merino ewes and sired by the same rams averaged 10·4 lb. at birth. It is important to realise the significance of these figures and select crossbred ewes as fat lamb mothers.

Investigating the factors which influenced the birth weight of lambs in Western Australia, Border Leicester x Merino ewes were mated with Southdown rams and observations were made on the influence of sex, number born and level of prenatal feeding on birth weight and growth rate of the lambs under identical conditions. The results are set out in the following table:—

—	Birth Weight.		Time taken to reach Slaughter Weight. (65 lb. Liveweight.)	
	Males.	Females.	Males.	Females.
	Lb.	Lb.	Days.	Days.
Singles—				
Mothers very poorly fed ..	9·5	8·9	89	100
Mothers well fed	10·9	10·2	86	94
Twins—				
Mothers very poorly fed ..	7·7	6·5	111	123
Mothers well fed	9·8	9·2	99	107

Under average conditions, differences in the birth weight of single lambs of ewes well and poorly fed are not so obvious. The differences of the plane of nutrition in the experiment were extreme. However, the effect of feeding of the ewe on the birth weight of twins is commonly noted in the field.

The Growth of Lambs after Birth.

The birth weight of the lambs, the breed of the sheep and the milking capacity of the mother are all important factors influencing the growth rate of lambs.

The milking capacity of ewes has been studied on a number of occasions and here again differences due to breed and to the way the ewes are fed have been noted. Crossbred ewes not only milk longer and more heavily than do Merinos but they also show a definite peak, reaching maximum production in about three weeks after lambing.

The lactation curve of average ewes is shown in Plate 24

Growth is really a period of protein storage and accordingly the protein requirements of rapidly growing animals is high, but it falls considerably as maturity is reached. This is depicted graphically in Plate 25.

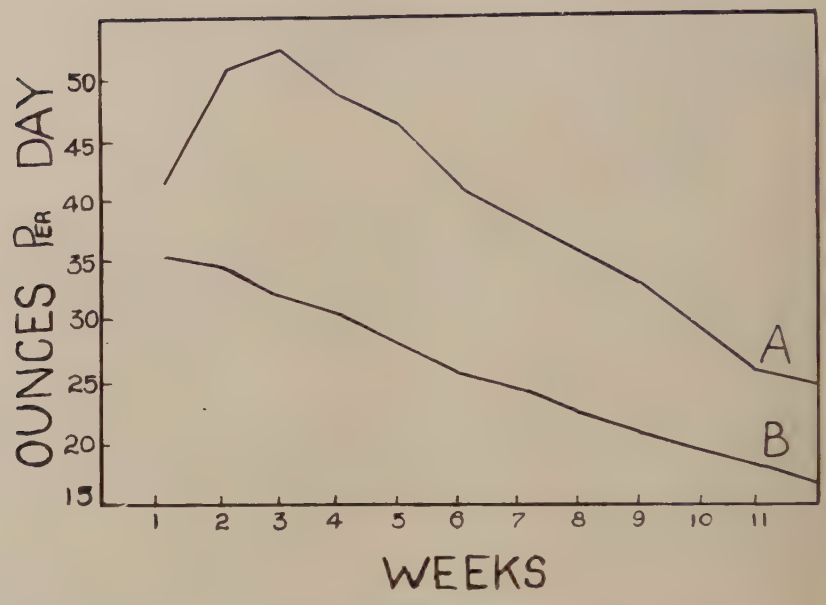


Plate 24.

LACTATION CURVES OF A, CROSSBRED EWES; B, MERINO EWES.

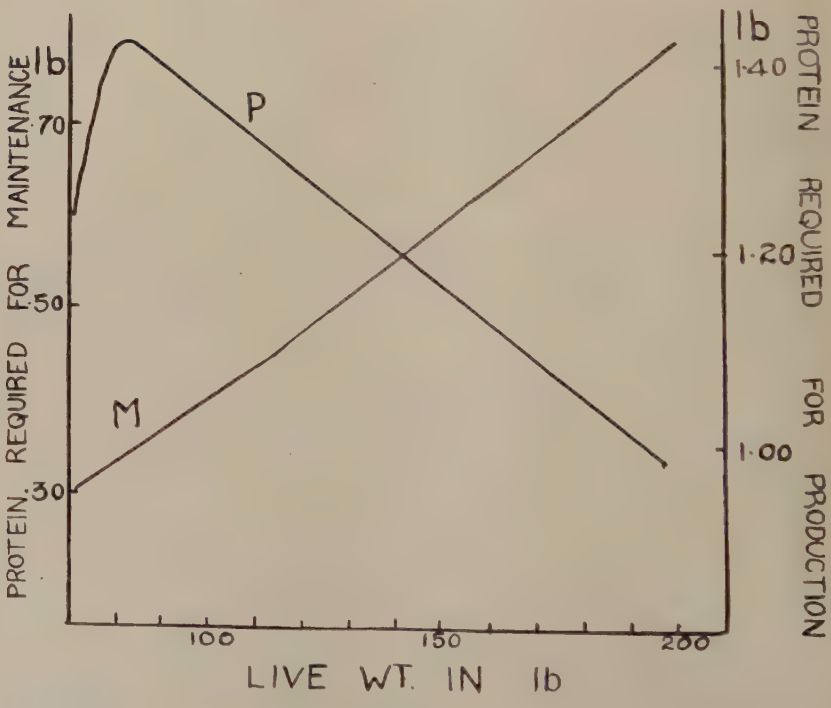


Plate 25.

PROTEIN REQUIREMENTS OF SHEEP FOR MAINTENANCE (M) AND PRODUCTION (P) IN LB. PER WEEK.

The relationship between liveweight and cumulative feed consumption is well known to all sheep men who have observed the growth made by lambs in relation to the way a crop has been grazed. The relationship could be depicted in the way shown in Plate 26.

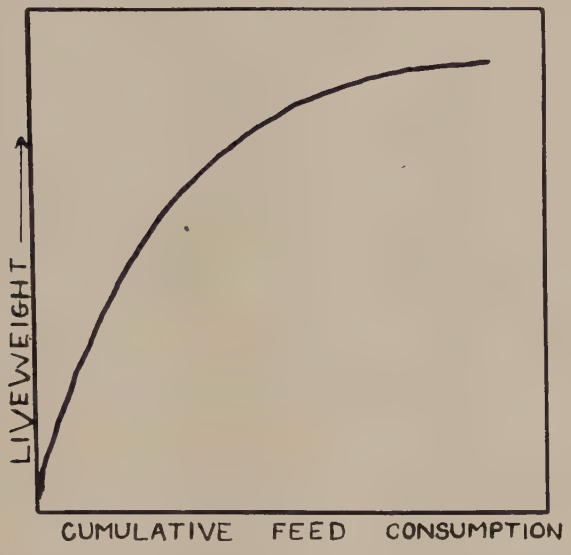


Plate 26.

Relationship between Liveweight and Cumulative Feed Consumption.

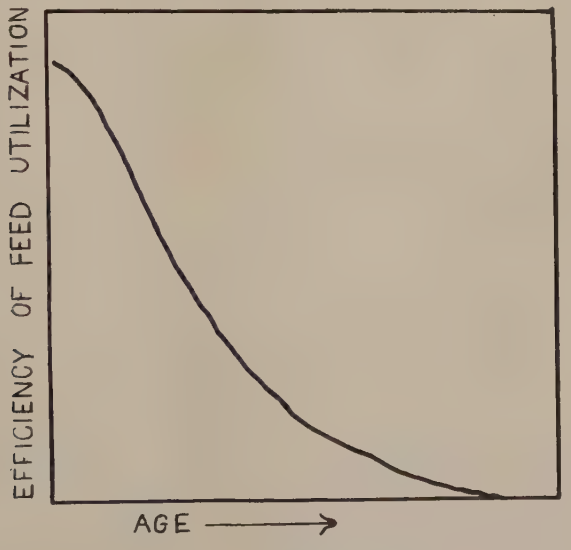


Plate 27.

Efficiency of Feed Utilization, or $\frac{\text{Weight Gain}}{\text{Feed.}}$, Related to Age.

There is a decrease in rate of liveweight gain as the cumulative feed consumption increases. In other words, the efficiency with which the lamb converts its food to flesh decreases as it grows older. This occurs in the way depicted in Plate 27.

The efficiency with which food is utilised for the production of meat is also an important breed characteristic. Differences between breeds such as the Merino and the Southdown or the Dorset Horn would be shown by the variation in the shape of the efficiency curve in Plate 27. It is usually considered that the graph for the efficiency of conversion by Merinos drops earlier and more steeply than for Southdowns and Dorsets.

Influence of the Plane of Nutrition on Growth and Carcase Quality.

The relative proportions of different parts of the body change with age while the animal is growing. While breed influences the rate and type of change, the plane of nutrition which the lambs enjoy from birth until they are sold is of greatest importance. The aim in lamb production is to ensure that the young animal, with its high proportion of stewing chops, neck, shins, and shank, quickly develops the deep fleshing of the valuable hindquarters.

In studying the effect of the plane of nutrition on the growth and development of lambs, several research workers have experimented with different rations and the results which have been obtained are depicted in Plate 28.

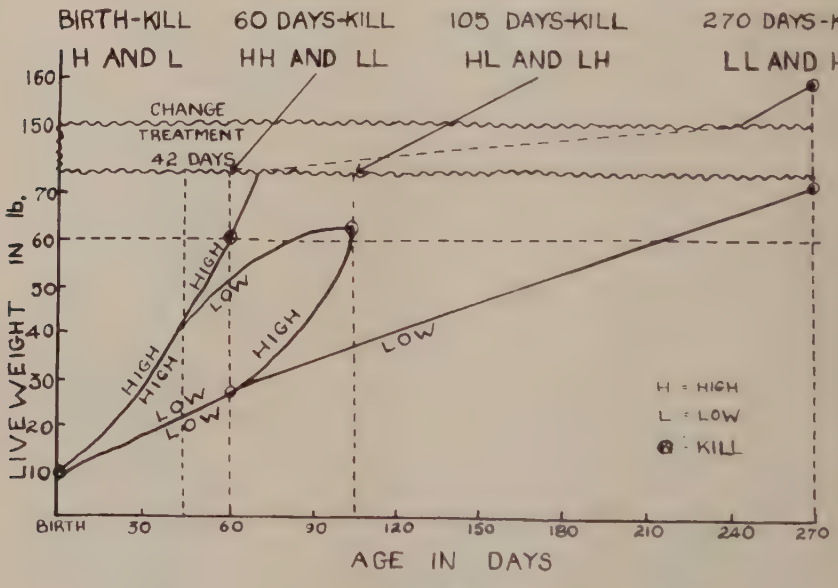


Plate 28.

THE EFFECT OF PLANE OF NUTRITION ON BODY WEIGHTS OF FAT LAMBS.

The different growth curves were plotted prior to the commencement of the experiment and feed was regulated to make the liveweights follow the curves.

Ewes were divided into two groups, one on a high plane of nutrition and the other on a low plane. Feeding the mother for the last two months of pregnancy makes possible an increase in the birth weight of the lamb and so alters the composition of the tissue.

The high-plane ewes gained 39½ lb. in weight before lambing, whereas those on the low plane had only increased by 1 lb. After lambing, milk yields were much greater for the high-plane ewes; also, they were "in milk" for about four months as compared with two months for the low-plane ewes.

After 42 days both high and low lamb groups were subdivided; half the high group continued on a high plane (high-high), while the other half were reduced to a low plane (high-low). Similarly, with the low group half continued on the low plane (low-low) and the other half were increased to a high-plane ration (low-high).

Lambs from each group were killed periodically to examine the proportion of bone to muscle and fat.

Those killed from the high-high group showed a small proportion of bone with a higher proportion of muscle and fat.

The high-low lambs showed larger bones and more muscle and lacked finish.

The low-high kill showed small bones and moderate to good muscle; though lacking in fat, they were fatter than the high-low group.

It is known that muscle, fat, and bone grow at different rates and at different times, and the first to reach the period of most active growth is bone, then muscle, and then fat. When conditions are imposed (for example, a low plane of nutrition) which will reduce the speed of increase in the liveweight, the process of converting food to fat will be the first to stop, then muscle development, and finally bone.

Therefore, the successful production of good quality lamb, which shows the proportionate light bone to muscle and fat, demands continuous good feeding from before birth to the time of marketing.

From the commercial point of view it is essential to get the lambs off the property as quickly as possible and accordingly the importance of maintaining them on a uniformly high plane of nutrition is obvious. It was noted, however, that there was considerable difference in the relative proportions of fat, muscle, and bone in the carcases produced by the lambs subjected to the different methods of feeding. This is clearly seen by comparing the carcases shown in Plates 29, 30, and 31. Those from the other sheep which were grown on the high-high plane of nutrition showed a correct balance of muscle, fat, and bone (Plate 29). Those grown on the high-low plane of nutrition were lacking in fat but the skeletal and muscular systems were quite well developed (Plates 30 and 31). Of these, the carcase shown in Plate 30 was from a lamb which was badly bred and badly fed, and that in Plate 31 was from a lamb well bred but badly fed. Those grown on the low-high plane of nutrition lacked muscle development and the fat was laid down unevenly. Those grown on the low-low plane of nutrition had long, poorly covered bones.

From the point of view of conformation and quality, then, a uniformly high plane of nutrition is necessary.

A point worth remembering is that sheep which are well fed—that is, are on a high plane of nutrition—are more likely to be affected adversely by hot weather. This is important when summer crops are being utilised for lamb production. However, they are less likely to be affected adversely by worm infestation.

Plate 29.

A WELL-BRED LAMB WHICH WAS WELL FED THROUGHOUT, ENSURING AMPLE DEVELOPMENT OF THE HINDQUARTER AND LOIN AND AN IDEAL BLEND OF MUSCLE AND FAT.

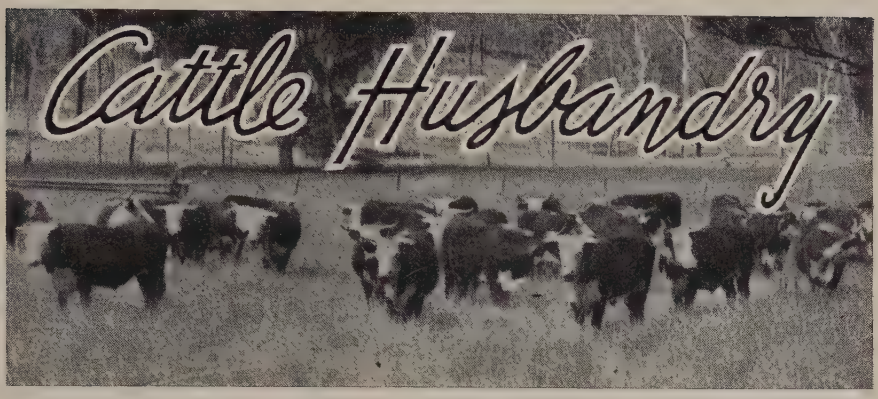
Plate 30.

The Carcase of a Badly Bred Sheep which was "Topped-off."—Note the excessive fat over the small "eye" muscle of the chops.

Plate 31.

WELL BRED BUT BADLY FED.—This lamb was inadequately fed when young and finished off too quickly.

(TO BE CONTINUED.)



Feeding Dairy Cows for Profit and Production.

R. D. CHESTER, Officer in Charge, Cattle Husbandry Branch.

THE rational approach to the feeding of cows for milk production is to attempt to supply a ration balanced in energy, protein and mineral content for the volume of milk production.

A farmer's ability as an efficient feeder is measured by his capacity to adjust the cost of feeds and the value of milk produced so that the difference between costs and returns will be as great as possible. This means striking a balance between not feeding supplements at all, on the one hand, and feeding cows to the absolute maximum of their production capacity on the other. Generally, it will be necessary to feed a variety of feeds, most of which are home-grown, to cows selected for their production ability so that each cow produces a fairly high yield of milk.

To feed efficiently the farmer must produce a large amount of milk from each of his cows. The high-producing cow is more efficient in converting food to milk than is the low producer.

When planning a programme of heavy supplementary feeding, the farmer should also embark on a programme of breeding for high production and be prepared to cull out low producers from the herd. Each cow's capacity to produce milk is limited by certain inherited factors. Feeding for production above the inherited maximum will not result in increased output of milk and the extra feed will therefore be wasted.

THE IMPORTANCE OF HOME-GROWN ROUGHAGE.

Under Queensland conditions, production of milk or other dairy produce depends largely on the roughage feeds and profits will be large or small according to the ability of the farmer to produce suitable home-grown roughages cheaply and to supplement them with concentrates which are reasonably cheap.

Good results from feeding will most often be obtained when the value of large amounts of good quality roughages is realized. Generally, cows should have available as much good quality roughage as they can

eat. It is not sound thinking to hope that cows getting insufficient roughage to fill the gut can be induced to produce profitably by the addition of a few pounds of concentrate to the ration. However, high-producers are incapable of eating sufficient roughage for maximum production and some supplementary feeding with concentrates is necessary if the most profitable level of production is the aim of the farmer.

All dairy cows therefore should be fed all the hay and/or silage, plus grazing, that they can eat.

The best grazing is young green crops or fresh green pastures. As crops and pastures mature, their feeding value decreases and it becomes increasingly important to feed more concentrates.

Good quality legume hay is the best type of hay to use. It contains the same energy equivalent as good cereal or grass hay, but is richer in minerals and in protein, this latter quality being of particular importance in a State such as Queensland where frequently protein intake limits production. However, cereal hays are quite suitable for dairy cows provided they are supplemented by the right type of concentrate.

Silage is an excellent roughage feed, but it should not be used as the only source of roughage. However, if fed at the rate of about 3 lb. per day for each 100 lb. bodyweight it forms a very good supplement for feeding with pasture or hay. Silage may taint milk if fed immediately before milking. If this occurs, an alteration in the feeding routine should be made to ensure that all silage is fed at least two hours before the cows are milked.

CHOOSING CONCENTRATES TO SUPPLEMENT ROUGHAGE.

The roughage supplied will usually be that most easily and most economically grown on the farm. Having supplied cows with adequate roughage, the farmer must then turn his attention to the concentrate supplement to be fed in order to maintain a good milk yield. It is necessary to decide just what ingredients will be incorporated in the concentrate mixture. Having done this, it is then time to assess the rate at which to feed the mixture. These decisions will be guided by—

(*a*) Kind and quality of roughage fed,

(*b*) Milk production of each cow,

(*c*) Costs of various concentrate feeds,

(*d*) Price obtained for dairy produce.

The protein content of the concentrate will be determined by the type of roughage fed. Having decided the protein requirements, the farmer then must seek the cheapest combination of ingredients which will give a final concentrate mixture of the required protein content.

The character of the cow and her feed capacity should be studied. Some cows have the ability to eat larger quantities of feed than others and so will make use of more home-grown roughage and require less purchased concentrate. Avoid feeding too much grain and avoid especially sudden changes from roughage to grain feeding, as such methods will cause serious 'feed sickness' and a corresponding reduction in yield.

In order to feed with some degree of accuracy, it is necessary firstly to know within fairly accurate limits just what is the production of individual cows. It is then necessary to feed cows individually or in groups of cows of about the same production.

It is wasteful to feed a whole herd on the same basis. By this method, the higher producer gets too little feed and as a result her production is reduced, and the low producer gets too much food for which there is no compensating lift in production.

It is convenient to keep a chart in the dairy with each cow's name, her approximate daily production and the amount of concentrate to be fed.

Thus—

Name.	Production. Lb. of Milk.	Concentrate. Lb. per Day.
Belle	15	2
Beatrice	20	4
Buttercup	25	6

Provided roughage can be produced on the farm, it will be a cheap form of feed, and in these circumstances should be fed to the maximum possible limit. On the other hand, in dairies where roughage is purchased on the open market, it will frequently be more expensive per food unit than are concentrate foods. In such cases a different approach to rationing is necessary and the amount of roughages must be decreased and concentrates increased according to prices.

Where roughage is cheap, therefore, cows should be given constant access to this class of food.

TABLE 1.

Type of Roughage.	Percentage of Protein necessary in Concentrate.	Typical Concentrate Mixture
Lucerne Hay	10–12	Grain alone, or grain plus mill offals
Other Legume Hay of Choice Quality	10–12	..
Young Green Cereals, Choice Pasture	10–12	..
Mixture of Legume and Cereal Hay	14–16	Grain .. 3 parts
Legume Hay and Sorghum Silage	14–16	Pollard .. 1 part
More Mature Green Crops (Cereal or Sudan Grass or Millet)	14–16	Bran .. 1 part
Good Quality Pasture	14–16	Linseed Meal .. 1 part
Cereal Hay	18–20	Grain .. 3 parts
Fair Quality Pasture	18–20	Bran .. 2 parts
Mature Green Crops	18–20	Linseed Meal .. 4 parts
Mature Pasture	24	Grain .. 3 parts
Cow Cane	24	Bran .. 2 parts
Sorghum Silage	24	Meatmeal .. 2 parts

Where roughage contains no legume, it is wise to add 2 per cent. ground limestone to concentrate mixture.

Table 1 sets out the protein percentage required in the concentrate mixture for feeding with various forms of roughage. This table is an adaptation of a table by T. E. Woodward in the United States Department of Agriculture Year Book for 1939.

Because the protein content of the roughages will vary somewhat according to their stage of development at harvesting and according to the efficiency with which the original crops are conserved, the table should be interpreted liberally and adjustments made according to the quality as well as the type of roughage.

Suggested Concentrate Mixtures.

The following meals are given as suitable concentrate mixtures of the correct protein content for the various roughages as set out in Table 1.

Mixtures containing 14 *to* 16 *per cent. protein.*

(1)	Crushed oats	4 parts
	Cracked corn	4 parts
	Meatmeal	1 part
(2)	Crushed oats	1 part
	Crushed sorghum	2 parts
	Linseed meal	1 part
(3)	Crushed sorghum	3 parts
	Crushed corn	3 parts
	Cottonseed meal	1 part
(4)	Crushed oats	3 parts
	Crushed corn	3 parts
	Crushed sorghum	3 parts
	Peanut meal	1 part

Mixtures containing 18 *to* 20 *per cent. protein.*

(1)	Crushed corn	2 parts
	Crushed sorghum	1 part
	Bran	1 part
	Pollard	1 part
	Peanut meal	1 part
(2)	Crushed sorghum	3 parts
	Crushed oats	2 parts
	Crushed corn	2 parts
	Meatmeal	2 parts
(3)	Crushed oats	1 part
	Crushed corn	2 parts
	Linseed meal	2 parts
(4)	Crushed sorghum	5 parts
	Crushed maize	6 parts
	Linseed meal	2 parts
	Peanut meal	2 parts

Mixtures containing 24 per cent. protein.

(1)	Crushed corn	2 parts
	Crushed oats	1 part
	Bran	2 parts
	Peanut meal	2 parts
	Linseed meal	2 parts
(2)	Crushed corn	9 parts
	Crushed oats	4 parts
	Meatmeal	7 parts
(3)	Crushed corn	6 parts
	Crushed sorghum	6 parts
	Crushed oats	3 parts
	Bran	5 parts
	Pollard	5 parts
	Peanut meal	6 parts
	Meatmeal	6 parts
(4)	Crushed corn	4 parts
	Crushed sorghum	4 parts
	Cottonseed meal	8 parts

Estimating Amount of Concentrate to Feed.

In feeding the concentrate, it is convenient to estimate the amount to be fed on a per-gallon-of-milk-produced basis. That is, if concentrate is to be fed at 2 lb. per gallon, the cow producing three gallons of milk will receive 6 lb. of concentrate, and so on.

TABLE 2.

A GUIDE TO FEEDING CONCENTRATE MIXTURE.

Breed of Cattle.	Where Cows are Fed all the Roughage They will Eat.	Where Roughage Feeding is Limited.
Friesian	1 lb. concentrate mixture to 4·5 lb. milk	1 lb. concentrate mixture to 4 lb. milk
A.I.S. and Ayrshire	1 lb. concentrate mixture to 4 lb. milk	1 lb. concentrate mixture to 3·5 lb. milk
Jersey and Guernsey	1 lb. concentrate mixture to 3·5 lb. milk	1 lb. concentrate mixture to 3 lb. milk

However, some adjustment should be made for the butter-fat content of the milk. It is sufficiently accurate to estimate according to the average test of the breed. Table 2 sets out the rate at which to feed concentrates to each breed if the farmer aims at feeding for full production.

It should, however, be borne in mind that frequently it will not be profitable to feed at this level under Queensland conditions, and in that case the farmer must be prepared to settle for something less than full production from his cows.

The Selection of Concentrate and Grain to Feed.

By consulting Table 3, which sets out the average food unit value and digestible crude protein content of the commonly available concentrates, the farmer should be able to substitute one concentrate for another in any of the mixtures given, if the constituents for the original meal are not readily available.

TABLE 3.

FODDER VALUES OF COMMONLY USED CONCENTRATES.

	Average Food Units per 100 lb (Starch Equivalent).	Digestible Crude Protein per 100 lb.
	Protein-rich Concentrates.	
Blood Meal	63	68
Meatmeal	77	54
Peanut Meal	78	43
Cottonseed Meal	67	33
Linseed Meal	72	25
	Carbohydrate-rich Concentrates.	
Maize Grain	77	8
Wheat Grain	72	8
Oat Grain	61	8
Sorghum Grain	76	7
Bran	56	10
Pollard	66	10
Molasses	50	Nil

In any case, these mixtures should only be taken as guides and alterations must be made according to the price of the various ingredients if the most profitable level of feeding is sought.

Generally, price per food unit and price per pound of protein will determine the particular concentrate to be used, though factors of palatability and texture must be considered.

It is, where possible, preferable to feed a mixture of grains rather than one particular grain, but this general rule may be ignored if one type of grain is very much cheaper than others. For instance, if a farmer can produce grain sorghum on the farm at a low price it would be unwise for him to purchase other grains on the open market to mix with his grain sorghum just for the sake of feeding a better balanced grain mixture.

In selecting grains, therefore, the choice should be made according to cost per food unit.

In selecting protein-rich concentrates, the choice will be determined by the cost per pound of protein rather than the cost per food unit, as generally these concentrates are fed in order to build up the protein percentage of the ration, though of course, at the same time, they do replace part of the energy-rich concentrate in the ration.

Estimating Cost of Grain.

The following is suggested by H. J. Geddes of the Sydney University as a convenient method of estimating the cost per food unit of each grain from the price per bushel.

The Cost per Food Unit is equivalent to

$$\frac{\text{Cost per bushel}}{\text{Weight per bushel}} \times \frac{100}{\text{Starch Equivalent of Grain}}$$

The factors "weight per bushel" and "starch equivalent" of any particular grain are constant. Therefore, the factor

$$\frac{100}{\text{Weight per bushel} \times \text{Starch Equivalent of Grain}}$$

is constant for a particular grain and may be expressed as a constant figure, namely:—

Sorghum .. .. 1/46 (that is $\frac{100}{60 \times 76}$)

Wheat .. .. .. 1/43 („ „ $\frac{100}{60 \times 72}$)

Maize .. .. .. 1/43 („ „ $\frac{100}{56 \times 77}$)

Barley .. .. .. 1/36 („ „ $\frac{100}{50 \times 71}$)

Oats .. .. .. 1/24 („ „ $\frac{100}{40 \times 61}$)

Thus for sorghum—

$$\text{Cost per Food Unit} = \frac{\text{Cost per bushel}}{46}$$

The following is an illustration of the use of this method using hypothetical bushel prices.

Grain.	Cost per Bushel.	Constant Factor.	Cost per Food Unit.
	s. d.		*d.*
Sorghum	5 9	46	1·5
Wheat	7 2	43	2·0
Maize	9 0	43	2·5
Barley	4 6	36	1·75
Oats	6 0	24	3·0

Thus, at the prices per bushel given, the farmer would feed as much sorghum as possible and avoid the use of maize and oats.

Most protein-rich concentrates are sold on a per ton basis. In order to work out the cost per pound of protein, it is necessary to know the protein percentage and to estimate the price per 100 pounds from the price per ton. Then divide the cost per 100 pounds by the protein percentage. Thus peanut meal with a protein content of 45 per cent. at 15s. per 100 lb. costs fourpence per pound protein.

Mineral Requirements.

Some consideration should be given to the mineral content of the concentrate ration. The chief minerals which require attention are lime, phosphate and salt.

For milking cows, it is desirable to add 1 per cent. of salt to all mixtures in order to avoid the risk of deficiency.

Most concentrate mixtures, especially those containing a high proportion of grain, are low in lime and relatively rich in phosphates and in cases where the lime content of the roughage is not likely to be high 2 per cent. of ground limestone should be added to the mixture. However, where large amounts of legume roughage are fed, adequate lime will be available from that source and there will be no need for addition of limestone to the concentrate portion of the ration.

In many parts of Queensland, pastures are deficient in phosphate and in most cases farmers cannot afford to feed concentrates except in limited quantities; in such cases, bonemeal should be added to the concentrate mixture to ensure that cows take from one and a half to two ounces of bonemeal per day. Bonemeal, fed in this way, is to be preferred to cattle licks.

VALUE OF FARMYARD MANURE.

In a recent address to the Victorian Branch of the Australian Institute of Agricultural Science, Mr. A. C. T. Hewitt gave some interesting estimates of the monetary value of farmyard manure based on 1942 fertilizer prices. Calculations show that a dairy cow annually excretes some 12 tons of manure and urine valued at £9 12s.; a dry cow or bullock 7 tons worth £6 16s. 6d.: a sheep 15 cwt. worth £1 8s.; a pig 1 ton worth 14s.; a draught horse 12 tons valued at £11 14s.; and a hen 56 lb. worth 7½d.

When organic matter is lacking in farm soils, the manures would have higher values than those given, since they supply soil-improving material which is absent from ordinary fertilizers.

These figures are worth bearing in mind not only by livestock raisers but also by agriculturists who do not engage in livestock production, since they are a pointer to the value of mixed farming in maintaining soil fertility.

IRRIGATION IN THE MARANOA.

In a report to Parliament, the Commissioner for Irrigation and Water Supply (Mr. T. A. Lang) states that the mass concrete weir now under construction on the Balonne River near St. George will, in addition to providing an assured water supply for the town of St. George, allow of the irrigation of about 1,000 acres of land for lucerne and other fodder crops and thus provide an experimental area for development of south-western lands under irrigation.

The weir is 18 feet high and will impound 3,900 acre feet of water. Allowance is being made for raising the supply level a further 6 feet by the provision of crest gates which can be raised in times of high flow to avoid undue flooding.

DEVELOPMENT OF THE BURDEKIN.

Recent reports on the investigations into the water resources of the Burdekin River and their utilisation for agriculture indicate that a dam site at Burdekin Falls and a diversion weir site 20 miles down the river are being surveyed, and that a contour survey of lands that might be commanded from the diversion weir is being made.

Investigations to determine suitable pastures and field crops for the area are being made by the Department of Agriculture and Stock and the Commonwealth Council for Scientific and Industrial Research on the Department's Regional Experiment Station at Ayr, and C.S.I.R. is making a soil survey of lands that may be commanded. Irrigation technique is also being investigated.

Special attention is to be given to the irrigation of tobacco and sugar cane on Special experiment stations on the Burdekin.

J.F.O.'s First Anniversary.

THE Queensland Junior Farmer Organisation in its first year enrolled approximately 200 members, reports the Director of the Organisation (Mr. T. L. Williams).

During the year two special schools of instruction were held at the State Agricultural College at Lawes. It is hoped to increase this number to at least four in 1949. The schools have proved very popular with club members and many more were offering than could be accommodated. Lectures, practical demonstrations and film screenings have kept the students occupied, and the written examinations at the end of each school have indicated that much scientific and practical information has been gained.

It is intended to set up local supervising committees in each club area and to arrange for special field days on local farms for the purpose of demonstrating correct methods of farm and livestock management. Arrangements are also being made for members to attend field days organised by the Department of Agriculture and Stock.

Examination Results.

Results of the examination test conducted at the end of the second school of instruction are as follows: —

Group 1 (*over* 17).—Ronald Saville (Greenmount), and S. S. Dmitrieff (Thangool), 1st; E. W. Bellette (Thornlands), Les Dreger (Biloela) and John D. Puschmann (Plainby), 2nd; Ernest Esposito (Mt. Murchison) and Edward H. Jensen (Biloela), 3rd; Alf. Handley (Biloela), 4th; James P. Christiansen (Langmorn), 5th.

Group 2 (*under* 17).—Norman G. Madsen (Warwick) and L. W. Walsh (Southbrook), 1st; Douglas K. Madsen (Upper Freestone), Keith Shepherdson (Biloela) and Leslie R. Ralph (Ravensbourne), 2nd; M. J. Kerlin (Killarney), Basil Horne (Wondai) and Ralph E. Halliday (Ambrose), 3rd; Vincent E. Walker (Mondure), 4th; Norman Gustafson (Tannymorel), 5th; Ray Hopkins (Woodhill), 6th; Frank Mastroieni (Biloela), 7th; Stuart Ian Harris (Samford), 8th.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

SUNBATHING FOR INFANTS.

THE best places for sunbaths are on a well-protected veranda, in a room with the windows wide open, and, as the baby gets older, on the lawn. The best time to begin sunbaths is in the first warm weather, but if begun at this time of the year the early morning hours should be used. Winter babies should have sunbaths about midday.

When a mother has decided that the sun is just about the right heat for her baby's sunbath, she should expose just his arms and legs to the sun for about five minutes—once, and, later on, twice a day. By degrees the sunbath may extend to the waist and later on to the armpits. She should give half time to the front of his body and half to the back. Be careful in all cases to protect the head and eyes with a shady linen hat. The mother should hold the baby on her knee if possible so that while he is being sunbathed she can increase the activity of his circulation by stroking his limbs gently but firmly, starting at the hands and feet and working towards the body.

Watch the skin carefully and if the baby burns easily increase the time of the sunbaths slowly. With this method the baby's skin should gradually become tan and he will not burn so easily when holiday time comes round.

At the same time it is advisable to exercise care, especially if he is fair-skinned. A reliable sun-tan cream or oil should be spread over his skin before going on the beach, and it may be necessary to keep his body portected with clothing if it is found that he burns easily in spite of every precaution.

If sunburn does occur a soothing treatment in mild cases is to bathe the part with a strong solution of epsom salts in warm water, dry gently, and apply zinc cream. For severe burning an ointment which combines picric acid with a local anaesthetic is procurable and usually gives quick relief from the pain.

Any other questions on this and other matters connected with children may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

In the Farm Kitchen.

Cabbage Soup.

Ingredients: 1 head of white cabbage, 3 pints stock, ½ pint milk, 1½ oz. dripping, seasoning, 1 rasher of bacon, little flour or other thickening.

Wash the cabbage and shred finely. Put into a pan with just sufficient water to prevent sticking, cover and cook for 10 minutes. Drain well and return to the pan with the dripping and chopped bacon, cover and simmer for 20 minutes. Add stock, cover again, and cook gently for about an hour. Blend thickening to a cream with milk and stir into the soup, adding remainder of the milk. Cook until smooth and creamy.

Macaroni Soup.

Ingredients: 1 quart of stock, 6 oz. cooked macaroni, 1½ oz. grated cheese, ¼ pint milk, seasoning to taste.

Cook the macaroni (with a small onion, if liked) in salted boiling water until tender, then remove half the macaroni and boil the remainder until pulpy. Add stock and milk to make 1 quart in all, then add the first quantity of macaroni and additional seasoning to taste.

Bring to simmering point and divide into portions, allotting an equal amount of grated cheese to each.

Quicker Cookery.

There is a quick way of doing most jobs and here are a few cookery wrinkles which you will find make for ease and speed. When making soup, grating raw vegetables is better than chopping them, because that way takes very much less time.

By mincing pieces of fat before putting them in the oven for rendering down more fat will be extracted in less time.

Flouring sandwich tins after greasing prevents sticking. Dredge in the flour and, turning and tilting the tin, give it several sharp taps with the hand.

For cutting rinds off bacon, fins off fish and the like, try using scissors instead of a knife. This method is much quicker and satisfactory.

Heating a tomato makes it peel easily. Hold a tomato on the end of a skewer in the heat for a minute or two, without scorching it. The tomato will then peel quite easily.

For covering a basin for steamed pudding, grease a square of greaseproof paper, cut to overlap the basin rim by three inches. Lay this greased paper over the top of the basin, fold the edges under and twist end of paper to fasten securely.

When chopping food and the like, keep the point of the knife firmly on the board all the time with the left hand. Chop by moving handle up and down sharply, swinging backwards and forwards in a semi-circle.

Salty Flavours.

A pinch of salt added to coffee brings out the flavour well.

A pinch of salt to every pound of fruit preserves the flavour of jam.

To stiffen the bristles of a hairbrush, add a pinch of salt to the washing water.

Many bottle-necked decanters defy the penetration of the brushes used for cleaning but salt, mixed with vinegar and tea-leaves, will make all clear. Allow the mixture to stand in the stained decanter for an hour or so, shake briskly, then stand the decanter in reverse. The same treatment may be used with jugs and all bottles.

If milk boils over on to the stove, scatter a little salt on the spot and the odour vanishes, or if the chimney catches fire, hurl a few handfuls of common salt on the burning soot and you may not have to seek further assistance.

For stains on the egg-spoons just rub with a damp cloth sprinkled with salt.

Stained china, sinks, aluminium saucepans, etc., all respond well to a good rub with common salt.

To clean a porcelain hand-basin or bath, try rubbing with salt and kerosene.

THE WEATHER DURING DECEMBER, 1948.

Although there were scattered ½-inch to 1½-inch falls over the Central Highlands on the 1st, rainfall in the early part of the month was confined chiefly to the Downs, South and Central Coast districts with several 1-inch to 2-inch falls on the Downs and South Coast. Towards the middle of the month an isolated to scattered thunderstorm distribution commenced in the Carpentaria and extended through Central districts to the Warrego, Maranoa, and Downs, culminating in over 2-inch falls on the headwaters of the Dawson (Wandoan 293), and in some hailstorms on the Downs in the Bell-Oakey-Greenmount area on 15th. A fairly general light to moderate distribution on the Downs and South Coast Moreton from 17th to 20th extended up the coast to give 2-inch to 4-inch totals on 23rd and 24th on the coastal belt from Home Hill to Cooktown. During the last week of the month general rain commenced along the Western and South-western border districts and by the 31st had extended eastwards to the Coast. The Western and South-western districts and Warrego and Central Lowlands received the greatest benefit, many totals in these areas ranging from 3 inches to 6 inches and resulting in temporary flooding in Coopers Creek, Wilsons Creek, and the Bulloo and Paroo Rivers. Local heavy falls of 4 inches to 5 inches in the Cloncurry-Granada area caused a temporary suspension of rail traffic. On the Maranoa and Downs general moderate to heavy 1-inch to 3-inch totals were registered and scattered over 2-inch falls were recorded on the Central and Coastal highland areas. In the dry areas of the Western and Central interior these rains were the most beneficial for the past two years. Follow-up rains will be required next month in these areas to ensure good recovery from the protracted dry spell. For the month the Central Lowlands, Western districts, Darling Downs, Maranoa, Warrego, Peninsula South, and Lower Carpentaria all had over-average December rainfall. The Coastal districts were all below average, but the onset of monsoonal rains of 4 inches to 8 inches on the North and Central Coasts in the first four days of January have decreased rainfall deficiency in most parts of these areas.

Maximum temperatures for the State were mostly above overage (Dalby 90.6, plus 1.6; Mount Surprise 94.9, plus 0/2). Minimum temperatures were all above average, particularly in the Central Interior, where Longreach (70.9) was 3.4 degrees above normal. Many century readings were recorded inland particularly in the Western and North-western parts of the State.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

DECEMBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of years' records.	Dec., 1947.	Dec., 1948.		Dec.	No. of years' records.	Dec., 1947.	Dec., 1948.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	7·02	42	3·80	6·40	Caboolture	5·48	67	6·63	3·69
Cairns	8·53	61	1·53	6·91	Childers	5·80	48	4·28	4·43
Cardwell	7·95	71	6·89	4·94	Crohamhurst ..	7·19	50	1·82	8·002
Cooktown	6·53	67	4·35	3·39	Esk	4·76	56	11·77	4·21
Herberton	5·64	57	3·92	5·75	Gatton College ..	3·89	44	1·31	..
Ingham	6·77	51	1·12	5·14	Gayndah	4·21	72	5·17	4·54
Innisfail	11·16	62	2·61	4·55	Gympie	5·40	73	6·06	4·86
Mossman	8·00	19	3·21	12·50	Kilkivan	4·61	62	7·12	4·74
Townsville	5·33	72	1·33	3·30	Maryborough ..	5·05	72	3·93	4·35
Central Coast.					Nambour	6·65	47	6·61	8·31
Ayr	4·20	56	2·37	6·78	Nanango	3·86	61	12·70	4·42
Bowen	4·49	72	1·16	4·76	Rockhampton ..	4·67	72	4·43	2·55
Charters Towers ..	3·26	61	1·89	3·64	Woodford	5·34	55	8·64	4·78
Mackay	6·86	72	2.96	4·47	*Darling Downs.*				
Proserpine	7·72	40	1·37	4·03	Dalby	3·49	73	6·98	4·55
St. Lawrence ..	4·67	72	2·13	2·42	Emu Vale	3·52	47	7·73	5·14
Central Highlands.					Jimbour	3·44	64	3·39	3·54
Clermont	3·77	72	3·07	1·24	Miles	3·17	58	6·82	7·35
Springsure	3·28	74	7·00	1·66	Stanthorpe	3·56	70	6·00	3·59
South Coast.					Toowoomba	4·53	71	7·83	6·64
Biggenden	4·85	44	1·64	2·81	Warwick	3·50	78	7·05	6·12
Bundaberg	5·10	60	8·07	3·28	*Maranoa.*				
Brisbane Bureau ..	4·95	96	8·14	3·21	Roma	2·59	69	4·33	3·44
					St. George	2·09	62	3·80	3·44

(Weather and rainfall information supplied by Divisional Meteorologist, Brisbane.)

ASTRONOMICAL DATA FOR QUEENSLAND.

MARCH.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.41	6.20	Cairns ..	31	27	Longreach	36	34
6	5.44	6.15	Charleville ..	27	27	Quilpie	35	35
11	5.46	6.10	Cloncurry	51	48	Rockhampton ..	10	10
16	5.49	6.04	Cunnamulla ..	29	29	Roma	17	17
21	5.52	5.59	Dirranbandi ..	19	19	Townsville ..	25	23
26	5.54	5.53	Emerald	19	19	Winton	41	39
31	5.57	5.48	Hughenden ..	35	33	Warwick	4	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	a.m.	p.m.
1	6.32	7.12
2	7.23	7.39
3	8.14	8.05
4	9.07	8.34
5	10.01	9.06
6	10.57	9.42
7	11.56	10.24
	p.m.	
8	12.56	11.13
9	1.56	..
		a.m.
10	2.54	12.10
11	3.47	1.14
12	4.35	2.22
13	5.17	3.33
14	5.56	4.43
15	6.32	5.52
16	7.08	7.01
17	7.45	8.09
18	8.25	9.17
19	9.09	10.25
20	9.57	11.31
		p.m.
21	10.50	12.35
22	11.47	1.32
23	..	2.23
	a.m.	
24	12.46	3.07
25	1.44	3.45
26	2.40	4.18
27	3.35	4.48
28	4.27	5.16
29	5.19	5.42
30	6.10	6.09
31	7.02	6.38

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	21	18	38	33	12	9	43	38
6	12	28	27	43	2	19	30	51
11	10	30	26	45	0	21	28	53
16	21	18	38	34	12	9	43	38
21	30	9	46	23	21	0	54	26
26	26	13	43	29	18	3	50	32
31	15	24	31	40	7	15	35	46

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	34	25	54	47	38	32	29	22
3	25	36	47	55	32	40	21	31
5	15	45	40	60	25	46	14	37
7	7	53	36	66	20	51	7	44
9	2	56	33	67	17	53	3	46
11	6	55	35	67	20	52	6	45
13	16	46	41	61	26	47	14	38
15	28	33	50	54	34	38	24	29
17	41	20	57	44	42	29	34	18
19	52	8	66	36	50	21	43	8
21	56	2	68	32	52	17	46	3
23	54	3	67	32	51	18	44	4
25	51	9	65	36	49	22	42	9
27	42	19	58	43	43	28	35	17
29	32	29	52	50	36	35	26	25
31	21	39	44	57	29	42	18	34

Phases of the Moon.—First Quarter, 8th March, 10.42 a.m.; Full Moon, 15th March, 5.03 a.m.; Last Quarter, 21st March, 11.10 p.m.; New Moon, 30th March, 1.11 a.m.

On 21st March at 9 a.m. the Sun will cross the equator—Equinox—and on this day it will rise and set at true east and true west respectively. On the 2nd, 15th, and 29th the Moon will rise and set approximately at true east and true west respectively.

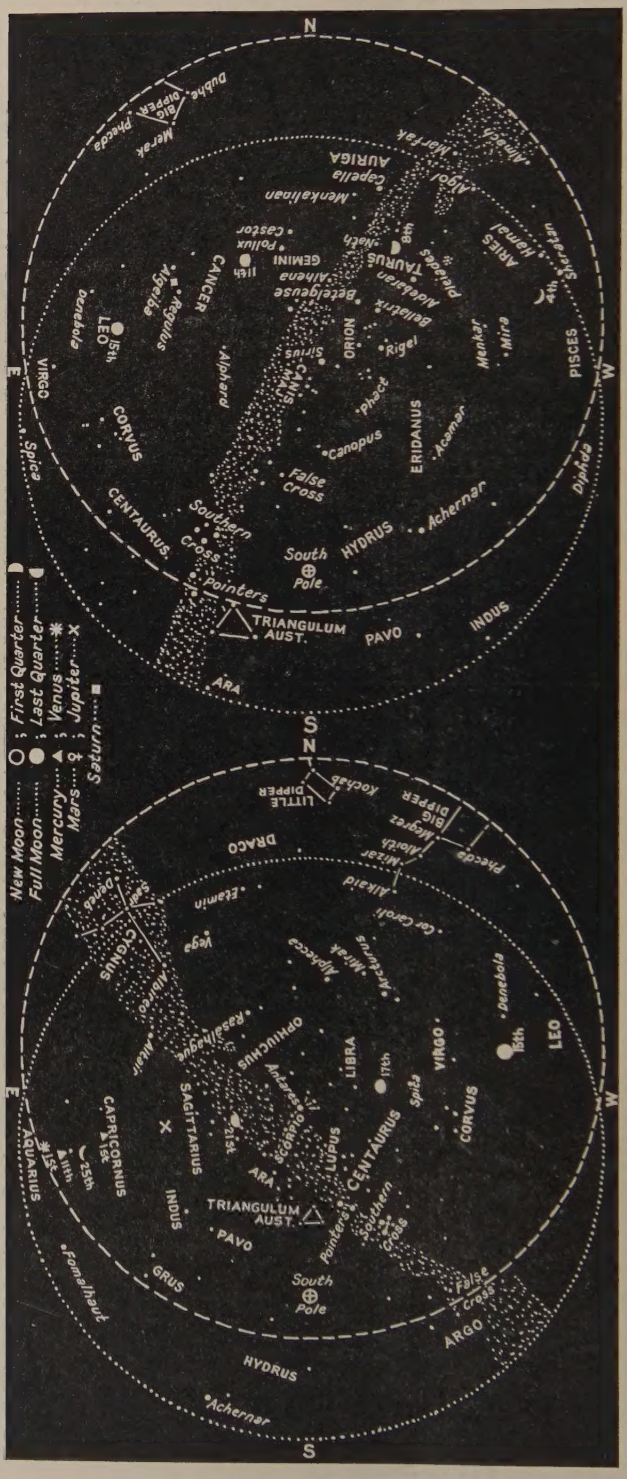
Mercury.—A morning object all this month and on the 1st, in the constellation of Capricornus, will rise 2 hours before the Sun, while by the 31st it will have reached the constellation of Pisces and will rise about 1 hour before the Sun.

Venus.—Now too close in line with the Sun for observation.

Mars.—Also too close in line with the Sun for observation.

Jupiter.—In the constellation of Sagittarius, at the beginning of the month will rise between 2 a.m. and 3.15 a.m. and at the end of the month will rise a little after midnight.

Saturn.—Now the only naked-eye planet visible in the evening. In the constellation of Leo, at the beginning of the month will be above the horizon before Sunset and by the end of the month will set between 2.45 a.m. and 4 a.m.



Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory Border on the 15th March. (For every degree of Longitude we go west the time increases by 4 minutes.) The chart on the left is for 9 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.